The Effect of Acute Alcohol Intoxication on the Ability to Detect Sarcasm, and Metacognitive Judgements of Sarcasm Detection Ability

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Statement of Sources

I declare that this report is my own original work and that contributions of others have been duly acknowledged.

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Jason Turner Date

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List of Acronyms

ACS-AS	Advanced Clinical Solutions – Affect Naming
AMM	Alcohol Myopia Model
ANDI	Adjusted Normalised Discrimination Index
AUDIT	Alcohol Use Disorders Identification Test
BAC	Blood Alcohol Concentration
BAES	Biphasic Alcohol Effects Scale
BMI	Body Mass Index
BrAC	Breath Alcohol Concentration
BRS	Beverage Rating Scale
ERT	Emotional Response Task
FIML	Full Information Maximum Likelihood
K10	Kessler Psychological Distress Scale
TASIT-S	The Awareness of Social Inference Test – Short Version
SEQ	Social Emotional Questionnaire
TLFB	Time Line Follow Back
ToM	Theory of Mind
UTAS	University of Tasmania

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Abstract

Acute excessive alcohol-intoxication has been increasingly linked to negative social behaviours such as increased aggression, one punch assaults, and partner-related violence, however the underlying mechanisms underpinning these processes are not yet understood. This study aimed to establish whether alcohol intoxication impairs the ability to detect and differentiate sarcasm, a type of theory of mind concerned with the ability to infer the intentions, beliefs, and perspectives of others. An additional aim of the study was to examine if metacognitive judgements (insight) of sarcasm detection ability is also impaired following alcohol-intoxication. Following quasi-random allocation counterbalancing for gender, 47 participants were administered either an alcohol (M_{age} = 23.31, *SD* = 4.33) or placebo (M_{age} = 22.71, *SD* = 3.23) beverage. Theory of Mind abilities were assessed using The Awareness of Social Inference Test – Short Version (TASIT-S). Metacognitive performance was measured by obtaining confidence ratings of between zero and 100 percent for each sarcasm detection item. While no overall impairment in sarcasm detection ability was found for alcohol-intoxicated individuals, intoxicated individuals were poorer at comprehending how an actor is feeling when the actor is being sincere and telling lies. Intoxicated individuals also demonstrated impaired insight and over-confidence in metacognitive judgements. These findings provide new insight into the possible underlying mechanisms of acute alcohol-intoxication and negative social behaviours, and have important policy implications.

The Effect of Acute Alcohol Intoxication on the Ability to Detect Sarcasm and Metacognitive Judgements of Sarcasm Detection Ability

Alcohol (Ethanol, C_2H_6O) is one of the most widely available and used psychoactive substances. It occupies a significant place in Australian culture, being tantamount with relaxation, leisure and socialisation. Alcohol is of interest because its known anxiolytic properties have the ability to reduce tension by inducing cognitive and behavioural changes, such as relaxation, euphoria and disinhibition (Begleiter & Platz, 1972). Several studies have shown that acute alcohol-intoxication can affect demeanour and influence social conduct, with increasing levels of intoxication often resulting in negative social behaviours, due to compromised cognitive control (Fillmore, Vogel-Sprott, & Gavrilescu, 1999: Fillmore & Weafer, 2004). According to the Australian Bureau of Statistics (ABS, 2015), between 2014 and 2015 around half (44 percent) of the Australian population (18 years and over) consumed in excess of four standard drinks in any one occasion, thus exceeding recommended 'single use' guidelines (National Health and Medical Research Council, NHMRC; 2009). Acute consumption of excessive levels of alcohol (exceeding blood alcohol concentration of .05 percent) is concerning given the potential for negative social behaviours which are often associated with higher rates of personal injury (Turner, Keller, & Bauerle, 2010), increases in aggression (Leonard, Collins, & Quigley, 2003; Morgan & McAtamney, 2009), and partner-related violence (Fals-Stewart, Leonard, & Birchler, 2005; Maldonado, 2014).

Acute excessive alcohol consumption has been associated with the initiation of negative social behaviours such as aggression (Bushman & Cooper, 1990; Attwood, Ataya, Benton, Penton-Voak, & Munafo, 2009). Acute excessive alcohol consumption is reported highest amongst young adults aged 18 to 24 years, with

around 70 percent of males and 60 percent of females in this group exceeding single use guidelines (ABS, 2015). Research by Kershaw et al. (2000) demonstrated that alcohol is a factor in around 40 percent of all assaults in the United Kingdom. In Australia, approximately 67 percent of victims of violence (aged between 25-34 years) attribute the cause of their assault to alcohol-intoxication (ABS, 2015). In the Australian media recently there has been a spate of alcohol-fuelled 'one punch assaults', which is a serious assault characterised by a single sudden knock to the head, which can often be debilitating, resulting in unconsciousness or even death (Pilgrim et al., 2014). During the 2000 to 2012 period a devastating 90 individuals were killed as a result of 'one-punch assaults', with alcohol being a contributing factor in around 73 percent of cases (ABS, 2015). Despite the established links between alcohol and negative social behaviours, and associated community concern, the exact mechanisms underpinning these processes are not yet understood.

One possible explanation is that such inappropriate behaviour could reflect the potential of alcohol to impair social cognition, a key component of successful social interaction. Social cognition can be described as being comprised of two key processes. The first involves the lower-order processes of emotion perception ability (e.g., perceiving that another person is sad or happy) and emotional or affective empathy (e.g., assimilating the feelings of another), whilst the second involves higher-order processes of theory of mind (ToM), the ability to see another person's point of view or being able infer the beliefs, feelings, and intentions of others (McDonald, 2013). ToM thus compromises of both affective (i.e., what the person is feeling) and cognitive (i.e., what the person is thinking) elements, the affective element of which is often seen in the literature as being synonymous to the term 'cognitive empathy' (Shamay-Tsoory, Aharon-Peretz, & Perry, 2009) (see Figure 1).

Making the correct mentalistic inferences in relation to others, whether it be related to affective or cognitive behaviours, is a complex process and one that is essential for successful social interaction (Bora & Zorlu, 2016).

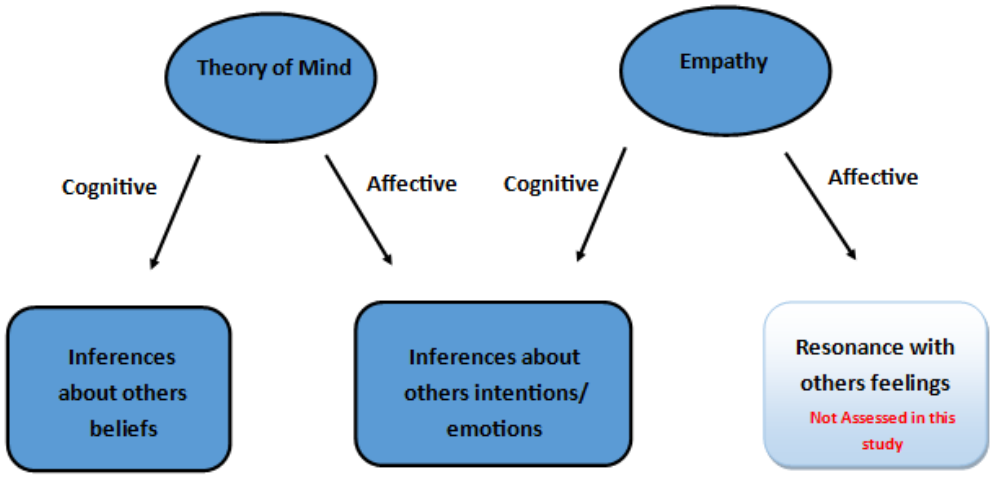

Figure 1. Diagrammatical representation distinguishing the cognitive and affective aspects of Theory of Mind and Empathy.

Theory of Mind

Human beings and many other species incorporate a wide variety of cues (i.e., emotional expression, posture of body, vocal tone) in their communication – to make mentalistic inferences so that they are able to predict the behaviour of another. ToM is an aspect of social cognition that encapsulates the ability to make inferences regarding other people's mental states, i.e., their beliefs, perspectives, feelings, and intentions (McDonald, 2013). Social cognition skills, such as affect recognition/interpretation, facial memory/recognition, and ToM are largely independent from general cognitive skills, such as memory and attention (McDonald, Honan, Kelly, Byom, & Rushby, 2013). It is thought that, higher-order social cognitive processes require intact lower-order motion perception abilities, as well as other cognitive processes such as receptive language, and attention (McDonald,

2013). Social cognitive function appears to engage different brain structures (i.e., orbito-ventral and medial frontal lobes) from general (non-social) cognitive function (i.e., dorsal regions of the lateral and medial prefrontal cortex) (Amodio & Frith, 2006; Carrington & Bailey, 2009), however some research indicates that this may be partially mediated by working memory (Honan et al., 2015).

One aspect of ToM is the ability to detect sarcasm. Sarcasm is defined in terms of its *social* pragmatics and is generally considered to be an aspect of *language* pragmatics, one which often involves meaning inversion. Pragmatics is a term used to describe the way in which 'context' contributes to meaning. For example, how "G'day how are ya?" is interpreted by an individual is dependent on the manner in which it is expressed. In this respect, the same words may convey very different meaning depending on how it is uttered. On the one hand, the words may be uttered with sincerity (i.e., the person is genuinely wanting to know how the person is), or it may be uttered using a contradictory tone of voice (e.g., a very hesitant tone) that is not consistent with its meaning, thus providing a clue that the speaker is being sarcastic. With language pragmatics being required for successful social communication, sarcasm is of interest due to its ambiguous nature and pervasive permeation of everyday language and culture.

To date, few studies have examined the effects of acute alcohol-intoxication on ToM ability. One study found impairments on two vastly different ToM tasks in alcohol-intoxicated individuals who had consumed six to eight standard alcoholic drinks (Mitchell, Beck, Royal, & Edwards, 2011) including *The Faux Pas Recognition Test* (Stone, Baron-Cohen, & Knight, 1998), which involves reading lengthy vignettes to participants, and the *Reading the Mind in the Eyes* task (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001), which involves examining black

and white images of eyes only and selecting what the person is thinking or feeling from a list of response options. In contrast to these findings, no such impairments were identified in an alcohol-intoxicated sample implementing the Multi-Faceted Empathy Test (Dziobek et al., 2008), which requires participants to make inferences regarding emotionally charged photographic scenes (Dolder et al., 2017). Dolder et al. found acute alcohol-intoxication biased emotion perception towards improved decoding of positive emotions combined with increased concern bias towards positive stimuli. As there is currently no empirical evidence linking acute alcohol-intoxication to the ability of acutely intoxicated individuals to detect the ToM aspect of sarcasm, this research will help inform the understanding of the effects of acute alcohol-intoxication on social cognition.

Regions of the Brain Involved in Detecting/Interpreting Sarcasm

Neurophysiological evidence from the field of *alcohol dependence and brain deficits* suggests there are two core regions of the brain which mediate ToM ability. Firstly, the temporo-parietal junction is thought to mediate an individual's ability to track another person's mental state; for example, their desires, beliefs, and intentions (Maurage et al., 2015). Individuals with a lesion or neuronal dysfunction to this area of the brain, therefore, are likely to demonstrate difficulties in the ability to understand another person's mental state, the misunderstanding of which is likely to result in social communication difficulties (Samson, Apperly, Kathirgamanathan, & Humphreys, 2005). Secondly, the lateral prefrontal cortex is thought to mediate an individual's ability to resist interference from their own perspective when there is incongruence with the desires, intentions, and beliefs from others (Samson, Apperley, Chiavarino, & Humphreys, 2004). That is, in order for ToM ability to occur, one must inhibit their own perspective in order to understand the perspective

of another person. Individuals with damage to the lateral prefrontal cortex resulting from alcoholism can show egocentric views, where it can be very difficult for them to realise that another person may have a differing point of view. Understanding how alcohol interacts with these processes is vital for further understanding of the mechanisms involved in social cognitive function following acute alcohol-administration.

Biologically, the neuroanatomical structures involved in the processing of sarcasm, and indeed pragmatic understanding generally are located in the right hemisphere (temporal parietal junction, insula), and pre-frontal cortex (PFC) (McDonald, 1999). The PFC is more broadly is involved in integrating higher-order cognitive functions such as, decoding and interpreting complex information, and initiating or executing responses based on knowledge acquired from ToM ability (Adolphs, 1999; Eslinger, 1998). Evidence of the involvement of these brain structures comes from two neuroimaging lesion studies which sought to examine the neuroanatomical basis of sarcasm in individuals with a history of moderate-to-severe traumatic brain injury (TBI), cerebrovascular accident, and/or brain tumour. These studies found that the right hemisphere is predominantly activated when detecting sarcasm, and that the frontal lobes (medial and ventral medial PFC, Brodmann's Area 47) and orbitofrontal cortex (OFC) are specifically involved in sarcasm interpretation (Shamay-Tsoory, Tomer, & Aharon-Peretz, 2005; Uchiyama et al. 2006).

In a neuroanatomical study involving sarcasm and its relationship with underlying brain regions, Shamey-Tsoory et al. (2005) explored the performance of individuals with right and left hemisphere focal lesions to the PFC and posterior parietal cortex. Individuals with damage to the PFC showed impairment of

performance on the sarcasm task whereas individuals with posterior damage performed the same task without difficulty. However, within the PFC group those with right ventromedial lesions demonstrated the most profound deficits in sarcasm comprehension. Right hemisphere damage was also associated with deficits in reading emotions, and overall PFC damage was associated with deficits to ToM, both of which are related to the ability to detect, understand, and interpret sarcasm.

Notably, the same brain structures and networks implicated by Shamey-Tsoory et al. (2005) have been demonstrated as being compromised in alcohol-intoxicated individuals, i.e., the right hemisphere, PFC, and OFC (Abernathy, Chandler, & Woodward, 2010; Oscar-Berman & Marinkovic, 2004). A recent social cognitive fMRI study by Gorka, Fitzgerald, King, and Phan (2013) implementing an emotion perception task with heavy social drinkers demonstrated that alcohol-intoxicated individuals display attenuated amygdala frontal activity, specifically differential bilateral amygdala activity and attenuated functional connectivity between the amygdala and OFC when processing basic facial emotions. Even at the most basic level of social cognitive processing, this study was able to show that the right PFC is implicated. Therefore, given regions of the brain which are implicated in the detection of sarcasm have also been found to be compromised in alcohol-intoxicated individuals, there is reason to believe that sarcasm detection ability may be impaired.

Metacognitive Judgements regarding Sarcasm Detection

In addition to social cognitive dysfunction, it is possible that an intoxicated individual's capacity to appraise their own social cognitive ability is also impaired. Metacognition refers to higher order thinking, or 'thinking about thinking' and is the knowledge one has about their own cognitive processes (Flavell, 1979). Accurate

self-appraisals of ability are important because it allows an individual – through monitoring 'online' performance – to make the necessary judgements required to modify and adapt behaviour so that it is more socially appropriate (Spada & Wells, 2009). An intoxicated individual may be less able to modify or change their behaviour because they fail to see that there is anything that requires correction, due to a lack of insight. Studies examining alcohol-intoxication and metacognition support this, demonstrating that alcohol-intoxication has the potential to interrupt the neurological systems that underpin meta-level monitoring, such as self-awareness and meta-cognitive monitoring (Spada & Wells, 2005, 2009).

Potential deficits with metacognition are concerning, given that metacognition is posited to accompany an individual's approach to everyday social engagement and interactions with others (Koren, Seidman, Goldman, & Harvey, 2006). Importantly, metacognitive functioning is argued to be a fundamental conduit between social cognitive ability and successful social interaction (Koren et al., 2006). Thus, successful social functioning not only depends on abilities and knowledge, but also on accurate self-appraisals of abilities and knowledge. For example, if an individual incorrectly remembers a specific fact (e.g., the year the Sydney Olympics were held) during conversation, and is extremely confident in their inaccurate memory they may vehemently defend the position that it was held in 2004 (displaying poor metacognition). Alternatively, they may demonstrate little confidence in their Sydney Olympics knowledge (good metacognition), and they may be more open and prepared to listen rather than defend an untenable position. Recently, impaired insight into the social cognitive domain of emotion perception in alcohol intoxicated individuals was demonstrated by Honan et al. (submitted),

however it is unknown whether insight is also impaired in alternative domains of social cognition, such as ToM.

The Alcohol Myopia Model

A prevailing theory describing alcohol-related behaviour is the Alcohol Myopia Model (AMM; Steele & Josephs, 1990), which contends that alcohol has a myopic effect on attentional resources. According to the AMM, with increasing intoxication comes a narrowing of attentional and cognitive processing, resulting in deficits in perceptual function and errors in processing cues (Giancola, Duke, & Ritz, 2010). The AMM prescribes that with increasing intoxication fewer attentional resources are available for attending to environmental cues, the consequence being that only the most salient cues are attended, whilst more subtler information go undetected. In hostile situations, it may be proposed that alcohol-intoxication narrows attentional resources towards more salient provocative cues (due to their alarming/threatening nature) rather than towards non-threatening or inhibitory cues. As a result of this 'myopic effect', the inhibitory cues which may be vital for accurate detection and interpretation of sarcasm are either not perceived or not processed. This in turn may potentially result in the execution of negative social reactions or behaviours (i.e., partner-spouse aggression or 'one-punch assault' scenario).

In a study incorporating the AMM to examine the effects of alcohol on violence, Giancola, Duke, and Ritz (2011) compared the results of intoxicated male participants exposed to either violence-promoting or violence-inhibiting cues, whilst measuring the resulting acts of displaced aggression (i.e., shocking a fictitious opponent). Despite equivalent levels of intoxication, it was found participants exposed to violence-inhibiting cues were substantially less aggressive (d = 1.65) than

their counterparts exposed to violence-promoting cues. In an alternative study incorporating the AMM, Denson et al. (2008) investigated high–low aggression cue salience on displaced aggressive acts in an intoxicated sample. The study found higher levels of aggressive behaviour from intoxicated individuals exposed to high salience aggression-inducing cues compared to intoxicated individuals exposed to low salience aggression-inducing cues. In this situation, inhibitory cues – which would normally assist to modify behaviour in consideration of socially appropriate conduct – were less salient and not obvious, thus requiring additional cognitive processing which in this case had been interrupted by alcohol. The findings of the study suggest that alcohol, though not the cause of aggression, does nonetheless 'direct' behaviour through the focusing of attention to the most salient cues in one's environment.

Generality of Levels of Intoxication

The empirical literature describes a generality of effects for levels of intoxication (Wulffson, 2015). Intoxication is traditionally measured by blood alcohol concentration (BAC), which is the percentage of alcohol present in the bloodstream. A BAC of 0.10%, indicates that there is the equivalent of one-part alcohol for every 1000 parts of blood. The higher the BAC, the larger the intoxication.

At BAC 0.02% to 0.03% a person may feel slightly relaxed and lightheaded, with improved mood and enhanced sociability. At BAC 0.05% to 0.06% inhibitions decrease, there can be mild euphoria, with behaviour potentially becoming exaggerated. At BAC 0.08% to 0.09% individuals can experience illusory superiority, whilst speech and judgement can be affected, and motor skills and memory can become impaired. At BAC 0.10% to 0.12% coordination and balance

can start to become impaired, euphoria continues, yet individuals display indecisiveness and exaggerated emotions. According to Vukovic, Modun, Markovic, and Sutlovic (2015), BAC readings are not statistically different from breath alcohol concentration (BrAC) readings when compared one hour after the consumption of alcoholic beverages. As such, this study will incorporate non-intrusive breath analysis testing to assess participants levels of alcohol concentration.

The Current Study

This study extends upon existing empirical evidence which demonstrates the potentiality of alcohol to impair ToM (Mitchell et al., 2011), by examining whether acutely intoxicated individuals are impaired in their ability to detect sarcasm an important aspect of ToM ability. The relationship between acute alcohol-intoxication and sarcasm detection will be measured using Parts 2 and 3 of the ecologically validated The Awareness of Social Inference Test – Short Version (TASIT-S; Honan et al., 2016) which assesses both the cognitive and affective aspects of ToM through four probing questions of *do*, *say*, *think*, and *feel*, across both *minimal* (Part 2) and *enriched* (Part 3) *environments*. TASIT-S assesses the ability to understand complex emotions, specifically with regards to the meanings, intentions, and beliefs of speakers, including social perception deficits specific to the ToM aspect of sarcasm. All video-based vignettes in TASIT-S require participants to demonstrate sensitivity to conversational inferences by interpreting the feelings, beliefs, intentions, and meanings of speakers where there is deliberate ambiguity in meaning. In addition, given the importance of metacognitive functioning in engaging in socially appropriate behaviours (Koren et al., 2006), participant self-evaluations of sarcasm detection ability will provide a subjective measure of meta-social-cognitive judgement (insight).

Hypotheses

It was hypothesised that:

1. Acutely-intoxicated individuals will perform more poorly than individuals in a placebo condition on a task assessing sarcasm comprehension ability. Sarcasm comprehension in this context will include both the ability to detect sarcasm when it is present, and the ability to recognise direct or explicit social communication exchanges (i.e., when individuals are being sincere or telling a direct lie) as not containing sarcasm.
2. Acutely-intoxicated individuals will demonstrate poorer insight and show greater overconfidence in their sarcasm comprehension ability than individuals in the placebo condition.
3. Acutely-intoxicated individuals will demonstrate poorer performance on both the affective and cognitive aspects of sarcasm comprehension tasks than individuals in the placebo condition.
4. Based on theories of alcohol myopia of limited attentional resources, acutely-intoxicated individuals will have more difficult than individuals in the placebo condition on sarcasm tasks embedded in an enriched contextual environment, than sarcasm tasks embedded in a minimally enriched environment.

Method

Participants

An a priori power analysis was undertaken with G*Power 3.1.9.2 indicating that a sample of 38 participants (19 in each condition: Alcohol; Placebo) would provide reliable power detection (0.80) of a statistically significant alpha (0.05), based on an estimated large Cohen's *f* effect (1.08) (Mitchell et al., 2011).

Recruitment of participants was undertaken at the University of Tasmania (UTAS), and also the wider community, via noticeboard advertisements, social media, the UTAS Psychology webpage (Appendix C), and by verbal invitation during lectures and practicals. Participants were quasi-randomly allocated (balanced for gender) to either condition (alcohol; placebo) by implementing Microsoft Excel randomisation.

The final sample comprised of 47 (23 female) participants aged between 18 and 35 years. First year psychology students were entitled to receive course credit, with the remaining participants receiving a movie ticket. Exclusion criteria included: regular tobacco smokers (typical daily use of one or more cigarettes); recent illicit drug use (preceding six months); current use of medicinal or recreational prescription medication (except contraception); drug study participation in the preceding three months; history of any significant neurological condition (e.g., epilepsy, TBI); current diagnosis of any significant physical condition (e.g., hypertension, anxiety); current diagnosis of a significant psychiatric disorder (e.g., major depressive disorder, schizophrenia); a score of 30 or higher on the Kessler Psychological Distress Scale (K10; Kessler et al., 2002); and a history of alcohol/drug abuse or dependence disorder, or use of alcohol at hazardous or harmful levels – evident via a score of 16 or higher on the Alcohol Use Disorders

Identification Test (AUDIT; Babor et al., 2001). Additionally, participants must have consumed at least two standard alcoholic beverages in the past, be fluent in English, completed Year 10 or equivalent, have normal or corrected-to-normal vision, and have a Body Mass Index in the range 18.5 to 29.9.

Materials

Eligibility Assessment

Alcohol Use Disorders Identification Test (Babor et al., 2001). The AUDIT is a screening tool developed by the World Health Organisation to identify drug and alcohol abuse/dependence – or alternatively, risky, harmful or hazardous patterns of drinking behaviour. The AUDIT consists of 10 questions across three domains regarding recent frequency of alcohol use, dependence symptoms, and alcohol-related problems. Each item is scored on a range from zero to four totalling a maximum of 40 points, where scores above eight indicate hazardous or problematic drinking, and scores over 16 indicate severe problems with alcohol. Individuals who scored 16 or over, therefore demonstrating greater tolerance, were excluded from the study. The AUDIT demonstrates high internal consistency (Cronbach's $\alpha = 0.83$ to 0.94), and shows high levels of predictive validity regarding sensitivity (0.78 to 0.96), and specificity (0.74 to 0.94) (Allen, Litten, Fertig, & Babor, 1997; Meneses-Gaya et al., 2010).

Kessler Psychological Distress Scale (Kessler et al., 2002). The K10 is a 10-item self-report questionnaire designed to yield a global measure of psychological distress (i.e., anxiety; depression) which may have been experienced over the past 30 days (e.g., "During the past 30 days, how often did you feel hopeless?"). Participants rate their feelings on a Likert scale (1 = 'none of the time' to 5 = 'all of the time'), according to which score best represents their current state of mind.

Scores are calculated to provide a total 'psychological distress' score, with a maximum value of 50. A score of 30 or more indicates high levels of psychological distress, and as such, those individuals were excluded from this study. The K10 demonstrates high levels of internal consistency (Cronbach's $\alpha = 0.84$), with good sensitivity (0.95) and specificity (0.54) indices (Arnaud et al., 2010).

Timeline Follow-back Questionnaire (TLFB; Sobell & Sobell, 1992). The TLFB is a self-reported drinking assessment that estimates alcohol consumption over the preceding month. Using a calendar, participants retrospectively indicate estimates of their daily alcohol consumption. The TLFB was incorporated to screen participants for overall drinking behaviour (pattern, variability, and magnitude) to ensure that a minimum of two standard alcoholic drinks on at least one occasion had been consumed in the preceding 30 days, and also to confirm that no alcoholic drinks had been consumed in the 24 hours preceding experimental testing. The TLFB demonstrates experimental efficacy, having been previously implemented in alcohol-intoxication studies assessing alcohol consumption behaviours (Fals-Stewart, 2003; Sobell et al., 1986). The TLFB exhibits good internal consistency (Cronbach's $\alpha = 0.84$), good test-retest reliability, and good convergent and discriminant validity against equivalent measures (Sobell, Brown, Leo, & Sobell, 1996; Yu Rueger, Trela, Palmeri, & King, 2012).

Baseline Measures

Social Emotional Questionnaire (SEQ; Hornak et al., 2003). The SEQ is a 19-item self-report measure of pre-morbid social cognitive functioning where participants are asked to rate the extent to which they agree with various statements (e.g., 'I notice when other people are happy', 'I am apologetic') on a 5-point Likert scale (1 = 'strongly disagree' to 5 = 'strongly agree'). The scale is comprised of five

factors, including: emotion recognition; emotional empathy; interpersonal; public; and antisocial behaviour. Scores are summed from the five subscale totals to determine levels of pre-morbid social cognitive function. The SEQ demonstrates good levels of internal consistency (Cronbach's $\alpha = 0.69$), and exhibits good construct validity through factor analysis.

Advanced Clinical Solutions (ACS) Affect Naming (ACS-AN; Pearson, 2009). The ACS-AN test is a subtest of the Wechsler Adult Intelligence Scale – IV (WAIS-IV) battery of tests, and was used to assess basic emotion perception ability at baseline. Participants were presented with a list of words concerning basic emotions (i.e., happy, sad, angry, surprised, disgusted, neutral) and were then shown 24 coloured pictures of faces expressing six basic emotions. Participants match each face to the word that best describes the emotion being displayed. The ACS-AN demonstrates adequate internal consistency (Cronbach's $\alpha = 0.69$).

Alcohol Intoxication Measures (Manipulation Checks)

Biphasic Alcohol Effects Scale (BAES; Martin, Earleywine, Musty, Perrine, & Swift, 1993). The BAES is a reliable and valid 14-item self-report measure assessing the subjective *stimulant* and *sedative* effects of alcohol consumption. Participants indicate the degree to which they are experiencing seven stimulant adjectives (e.g., 'talkative', 'excited') and seven sedative adjectives (e.g., 'inactive', 'down'), with scores assessed using an 11-point Likert scale (0 = 'not at all' to 10 = 'extremely'). Participant's responses for both the stimulant and sedative subscale scores are summed, with high scores indicating greater levels of the respective subscale. The BAES demonstrates high internal consistency for both stimulant and sedative subscales (Cronbach's $\alpha = 0.94$ and 0.85), and a strong factor structure determined through factor analysis. The BAES is administered multiple times

throughout an experiment to assess the biphasic effects of ascending and descending blood-alcohol trajectories (Rueger & King, 2013).

Beverage Rating Scale (BRS; Fillmore & Vogel-Sprott, 2000). The BRS assesses subjectively perceived levels of intoxication (i.e., did participants believe they consumed the alcohol or placebo drink). With the BRS, participants can select from a scale ranging from zero to 10 bottles of beer (4.8 percent alcohol per unit), in increments of 0.5 bottles. Participants indicate the number of alcoholic drinks which best represents their perceived peak level of intoxication during the experimental session. The BRS demonstrates empirical efficacy, having been utilised as a manipulation check experimentally by Fillmore and Vogel-Sprott (2000).

Breath Alcohol Concentration (BrAC). Participants breath alcohol was measured with a tested and calibrated Andatech hand held Alcolmeter 'Prodigy' Model, Serial Number 13002816, owned by UTAS.

Experimental Measures

Emotional Response Task (ERT; Montagne, Kessels, DeHaan, & Perrett, 2007). The ERT is a computer-generated paradigm measuring an individual's ability to recognise the expressions of six basic facial emotions, including: sad, happy, angry, fear, disgust and surprise. Stimuli for the ERT comprised of two male and two female Caucasian faces, where each face presented displayed one of the six basic facial emotions, with the emotional intensity of each facial expression morphing from a neutral face into either 20, 40, 60, 80 or 100 percent intensity. The duration it takes for the face to morph (to its predetermined intensity) varies from approximately one second for 40 percent emotions and three seconds for 100 percent emotions. The ERT commences with the lowest intensity emotions and progress to

the highest intensity emotions to control for priming effects. To control for any potential order effects two versions of the test with randomly ordered emotions were administered, with an alternative forced choice (six responses) used for each of the 120 video clips, with no time limit. The ERT has been validated in clinical populations (Rosenberg, 2015) and also in a healthy sample (Kessels, Montagne, Hendriks, & de Haan, 2013). The ERT was used in the study to help characterise the alcohol and placebo groups in terms of their lower-order social cognitive abilities.

The Awareness of Social Inference Task – Short Version (TASIT-S; Honan et al., 2016). The ecologically valid TASIT-S (Honan et al., 2016) is a recently developed shortened version of TASIT instrument (McDonald, Flanagan, Martin, & Saunders, 2004) which assesses emotion perception ability and ToM ability using videotaped vignettes. While the shortened version was developed based on the responses of 160 individuals with acquired brain injury, the full version has been used in various population groups including severe TBI, right hemisphere lesions, and frontotemporal dementia. TASIT-S is comprised of three parts, however only Part 2 and Part 3 that assess sarcasm detection ability were implemented (see Figure 2). Part 2 *Social Inference – Minimal*, comprises nine vignettes (15 to 60 seconds in length) of conversations between two actors. Participant's judgements of the conversations are based on the available dialogue, emotional expressions, and paralinguistic cues (see Figure 3). Four vignettes portray a sincere conversation, whilst the five other vignettes portray characters as being sarcastic. Participants' understanding of each vignette is examined through four probing questions that assess understanding of: (1) the beliefs or knowledge of the speakers (*Do*); (2) the beliefs or feelings the speaker intended to portray (*Say*); (3) whether the speakers want the literal or non-literal meaning of their statement to be believed (*Think*); and

(4) the emotional state of the speaker (*Feel*). Part 3 *Social Inference – Enriched*, comprising nine video vignettes of conversational exchanges portraying lies and sarcasm, lies are explicit in communication and thus should be easier to detect than sarcasm which requires subtle interpretation of language pragmatic cues. In this case, however, participants are provided with additional contextual information or cues within the vignette to help establish the scenario (i.e., newspapers, plates of food, or another person's influence) (see Figure 4). Four vignettes portray deception (i.e., lies), and five portray sarcasm. Appropriate responses to each probing question are "yes", "no", and "do not know". The total score was summed for each of the four subtests and then converted into total percentage correct. Equally, it is possible to calculate scores based on responses to the four probing questions (do, say, think, feel). Item examples are shown in Appendix G and H. The original TASIT demonstrates good test-retest reliability, and also strong convergent and divergent validities with other social and non-social measures sample with moderate-to-severe TBI (McDonald et al., 2006). TASIT-S demonstrates good construct validity with the original TASIT (Honan et al., 2016) where it correlates strongly and positively with respective subtests (r values >.87).

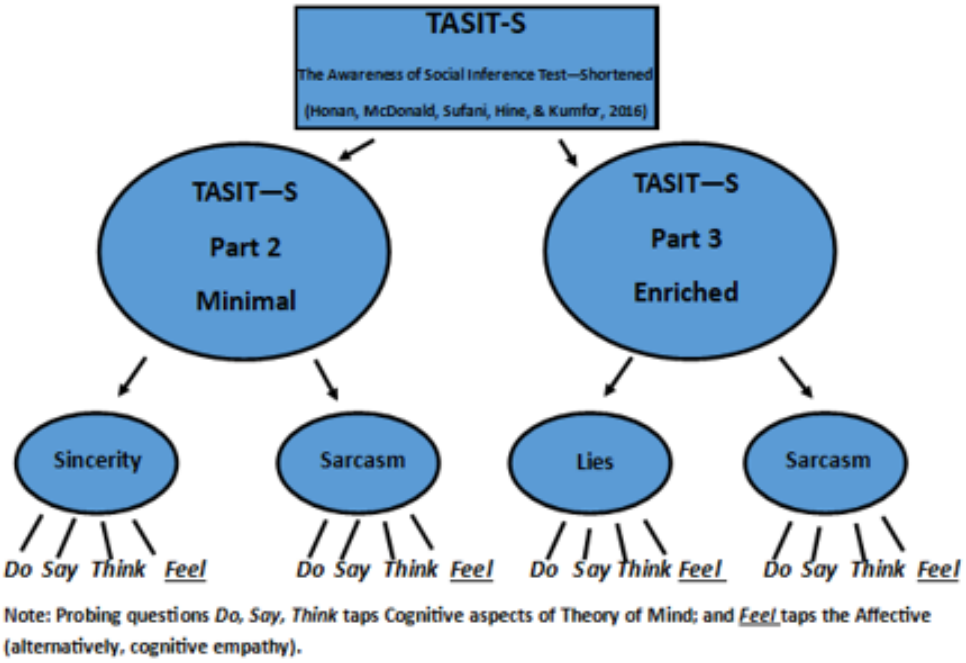

Figure 2. Flow chart diagrammatically demonstrating TASIT-S Parts 2 *Social Inference - Minimal* & Parts 3 *Social Inference - Enriched*, the four probing questions *do, say, think, and feel* tapping the affective and cognitive aspects of ToM.

Figure 3. TASIT-S *Part 2 Minimal*

Figure 4. TASIT-S *Part 3 Enriched*

Procedure

After completing relevant screenings and assessment measures, eligible participants attended the experimental session. To account for individual metabolism, each participant was required to refrain from consuming caffeine for eight hours prior to testing, and to fast from food for four hours, except for two pieces of toast to be consumed one hour before commencing experimental testing. On arrival at the experimental laboratory participants were welcomed and provided

with an information sheet regarding the experiment and were then invited to complete data forms pertaining to consent (see Appendix E, F), declaration of abstinence compliance, declaration for transfer of care for provisional driver licence holders, and authority to store data. The body weight of each participant was measured to facilitate calculation of the alcohol dosing equation (see below), and then the TLFB was completed as a final eligibility test. A baseline BrAC sample was taken to ensure abstinence from alcohol (BrAC .00%) prior to commencing testing. To control for alcohol expectancy effects, a 150ml beverage consisting of 10ml Lime syrup, four drops of Angostura® aromatic bitters, 136ml of soda water, and 4ml of vodka (Smirnoff Red Label®, No. 21) floated on top combined with a light spray of vodka into the cup (to create a robust alcohol smell) was consumed by participants prior to the administration of the baseline tasks, which included the BAES, SEQ, and ACS-Affect Naming test.

Depending on condition (alcohol; placebo) participants were supplied with one of two beverages. The alcohol group received a 750ml beverage consisting of 90ml Lime syrup, 5ml Angostura® aromatic bitters, an individually calculated Widmark equation (see Appendix I; Dry et al., 2012) dose of Smirnoff Red Label®, No. 21 vodka, and approximately 250ml of soda water mixed with 250ml of still water. The placebo group received a 750ml beverage consisting of 90ml Lime syrup, 5ml Angostura® aromatic bitters, and 300ml of soda water mixed with 300ml of still water. Within a 10-minute time period, participants were required to consume the 750ml beverage. On completion of a 50-minute absorption period, and prior to completing the ERT, a BrAC test was administered to record participants BrAC levels.

TASIT-S was then completed. After the administration of each probing question, participants were asked to rate their level of confidence level between zero percent representing no confidence to 100 percent representing total confidence that they were correct. Following administration of TASIT-S a further BrAC was taken, and the BAES and BRS completed. Participants were released from experimenter supervision following two consecutive BrAC readings of under .03% (15 minutes apart), or readings of 0.00% for provisional driver licence holders if they intended to drive.

Design

The current study employed a single-blind, placebo-controlled, quasi-randomly allocated (balanced genders across groups), mixed between and within groups design. Independent variables included condition (alcohol; placebo) and TASIT subtest (Part 2 Sincere, Part 2 Sarcasm, Part 3 Lies, Part 3 Sarcasm) and/or TASIT probing question type (Do, Say, Think, Feel). Dependent variables included correct identification of sarcasm/sincerity/lies or one of three calibration statistics (see below).

Statistical Analyses

Statistical analyses were conducted using IBM SPSS Statistics 24. Prior to undertaking *t*-tests data was assessed for compliance to normality of distribution, homogeneity of variance, and examined for outliers. A series of *t*-tests were undertaken to compare groups on age and baseline tasks, and a Chi-square test was implemented to assess proportions of gender. Full information maximum likelihood (FIML) mixed models analyses with structured covariance matrix was conducted to compare the alcohol condition to the placebo condition on the detection of sincerity

and sarcasm (in a minimal environment), and lies and sarcasm (in an enriched environment) across each of the four probe question domains (do, say, think, and feel). FIML mixed models was then conducted on metacognitive judgments of these abilities. Alpha levels for baseline tasks and manipulation measures were assessed for significance at $\alpha = .05$ level, and FIML mixed models analyses for TASIT-S performance and calibration statistics were assessed for significance at $\alpha = .01$ level, to help control for the presence of any Type 1 error. Specific within-subjects comparisons were made for similar explicit item types (i.e., sincere/lies) and similar subtle item types (i.e., Part 2 sarcasm/Part 3 sarcasm) to determine any differences across minimal versus enriched environments (i.e., sincere [minimal] vs lies [enriched], and Part 2 sarcasm [minimal] vs Part 3 sarcasm [enriched]).

Calibration analysis was undertaken to examine group differences in metacognitive judgements of sarcasm detection ability. Calibration can be described as the difference between an individual's judgment of success and their actual outcome, with calibrations deemed perfect when perceived judgment exactly matches performance – known as *Resolution* (Yaniv, Yates, & Smith, 1991) and can be expressed by using the Adjusted Normalised Discrimination Index (ANDI) which ranges from 0 (no discrimination) to 1 (perfect discrimination) (Palmer, Brewer, Weber, & Nagesh, 2013). Calibration statistics were calculated for Parts 2 and 3 of TASIT-S with values ranging 0 (perfect calibration) to 1 (worse possible calibration), and provided an indication of the extent to which the relationship between accurate identifications of sarcasm/sincerity/lies and confidence ratings deviate from optimal calibration (Brewer & Wells, 2006). Over- and under-confidence statistic values were also obtained for item types (do, say, think, feel), where the O/U statistic provided an indication of an individual's tendency to over- or

under-estimate their accuracy abilities. O/U statistic values range from -1 (complete under-confidence) to +1 (complete over-confidence), with scores derived by calculating the weighted difference between mean confidence and mean accuracy.

Results

Eligibility and Baseline Assessments

Independent samples *t*-tests revealed no significant differences between conditions on the AUDIT, K10, ACS-AN, TLFB, and on the five SEQ subscales (Emotional Recognition, Emotional Empathy, Interpersonal, Public, Anti-Social). See Table 1 for descriptive and inferential statistics.

Table 1.

Comparison of Conditions on Eligibility and Baselines Measures

	Alcohol		Placebo				95% $CIs_{DIFFERENCE}$		
	M	*SD*	*M*	*SD*	*t*(45)	Sig	LB	UB	*d*
ACS-AN	7.35	3.87	5.81	4.17	1.31	.197	-.83	3.90	.38
AUDIT	15.69	4.46	14.24	3.60	1.21	.233	-.97	3.88	.36
K10	19.00	1.77	18.90	2.12	1.68	.867	-1.05	1.24	.05
TLFB	22.50	16.28	15.86	16.67	1.38	.176	-3.08	16.37	.40
SEQ									
-EmotRec	21.00	2.58	20.76	2.96	.29	.770	-1.39	1.87	.09
-EmoEmp	16.58	2.21	16.43	2.48	.22	.830	-1.23	1.53	.06
-Interpers	8.96	2.16	9.38	1.88	-.70	.488	-1.62	.79	.21
-Public	10.38	1.72	10.86	1.35	-1.03	.310	-1.38	.43	.31
-Antisocial	13.54	2.83	13.86	2.24	-.43	.669	-1.81	1.17	.13

Note: ACS-AN = Advanced Clinical Solutions – Affect Naming; AUDIT = Alcohol Use Disorders Identification Test; K10 = Kessler Psychological Distress Scale; LB = Lower Bound; Social Emotional Questionnaire (Emotional Recognition, Emotional Empathy, Interpersonal, Public, Antisocial); UB = Upper Bound. There were no assumption violations on eligibility and baseline measures except for a violation of homogeneity of variance on the Antisocial subscale of the SEQ, Levene's $F(1,24) = 5.73$, $p = .021$, $d = 0.72$, thus equal variances not assumed statistic was interpreted.

Age and Gender Comparisons

Independent samples *t*-tests revealed no significant differences for age between alcohol (*M* = 23.31, *SD* = 4.33) and placebo (*M* = 22.71, *SD* = 3.23) participants, *t*(45) = .52, *p* = .604, *d* = .15.

A Chi-square test of independence revealed no significant differences between proportions of males (50%) and females (50%) in the alcohol condition compared to males (52.4%) and females (47.6%) in the placebo condition, χ^2 (1, N = 47) = 0.03, *p* = .871, Cramer's *V* = .02.

Manipulation Checks & Alcohol Intoxication Measures

Independent samples *t*-tests indicated that participants reported higher levels of perceived alcohol consumption (in 4.8% standard drink units, BRS) in the alcohol condition (*M* = 4.46, *SD* = 1.73) than the placebo condition (*M* = 1.67, *SD* = 1.30), *t*(45) = 6.13, *p* < .001, *d* = 1.64. One-sample *t*-tests indicated quantities of perceived alcohol consumption were significantly different than zero in the alcohol and placebo conditions, *t*(25) = 13.14, *p* < .001, 95% CI [3.76, 5.16] and *t*(20) = 5.89, *p* < .001, 95% CI [1.08, 2.26], respectively.

For the BAES, Figure 5 displays the mean *stimulation* and *sedation* subscale scores stratified by condition and across time-points. FIML mixed models analysis revealed a significant 2 condition (alcohol, placebo) x 4 time (baseline, pre-ERT, pre-TASIT-S, post-TASIT-S) x 2 subscale (sedation, stimulation) interaction, *F*(1, 6) = 3.98, *p* = .001. Post-hoc pairwise comparisons indicated no significant differences between conditions on stimulation [*F*(1, 1.134.34) = .10, *p* = .758, *d* = 0.09], and sedation [*F*(1, 1.134.34) = .48, *p* = .489, *d* = 0.21], at baseline. At Time 2 (pre-ERT) alcohol participants reported significantly higher levels of sedation [*F*(1, 1.134.34) = 4.84, *p* = .029, *d* = 0.64] than placebo participants, however, there were no

significant differences between conditions on levels of stimulation [$F(1, 1.134.34) = 1.15$, $p = .284$, $d = 0.3$]. At Time 3 (pre-TASIT-S) alcohol participants reported significantly higher levels of sedation [$F(1, 1.134.34) = 4.79$, $p = .030$, $d = 0.66$] than placebo participants, however, there were no significant differences between conditions on levels of stimulation [$F(1, 1.134.34) = .29$, $p = .593$, $d = 0.16$]. At Time 4 (post-TASIT-S) alcohol participants reported significantly higher levels of sedation [$F(1, 150.44) = 5.06$, $p = .026$, $d = 0.67$] than placebo participants, however, there were no significant differences reported between groups for levels of stimulation [$F(1, 150.44) = .02$, $p = .901$, $d = 0.04$].

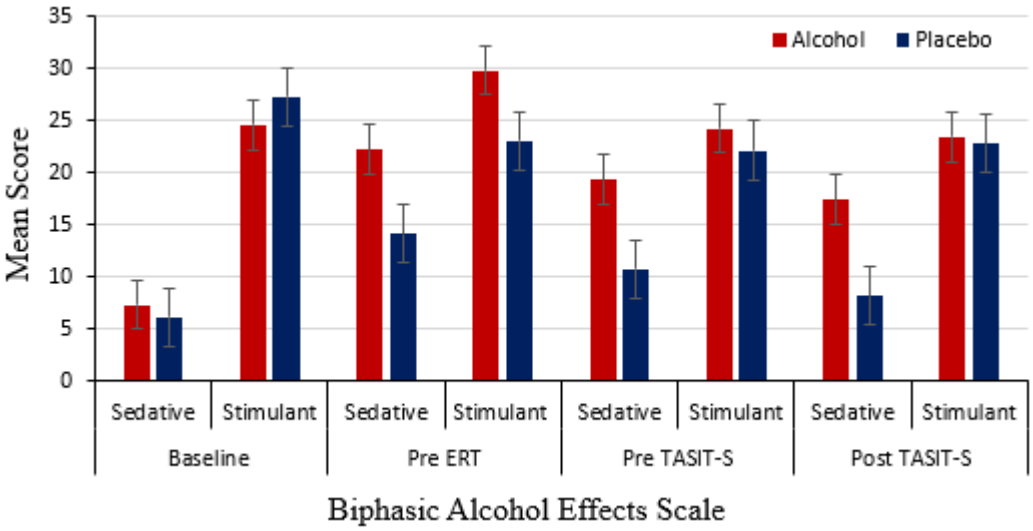

Figure 5. Subjective ratings of alcohol effects on *sedation* and *stimulation* on the BAES for each condition at baseline, pre-ERT, pre-TASIT-S, post-TASIT-S. Error bars represent standard error.

Breath Alcohol Concentrations (BrAC)

Repeated measures analysis indicated no significant difference between BrAC levels taken across pre-ERT ($M = .074$, $SD = .02$), pre-TASIT-S ($M = .075$,

SD = .02), and post-TASIT-S (*M* = .074, *SD* = .02) timepoints, *F*(1.22, 30.37) = 2.60, *p* = .112 (Greenhouse-Geisser correction applied). One-sample *t*-test analysis for the alcohol condition immediately prior to TASIT-S administration indicated this value was significantly different than zero, *t*(25) = 21.23, *p* < .001, 95% CI [0.07, 0.08].

ERT Performance

A 2 condition x 6 emotion FIML mixed models analyses revealed a significant condition x emotion interaction, [*F*(11, 189.36) = 51.00, *p* = < .001, *r* = .99], however post-hoc analysis revealed no differences across conditions for any emotion type (all *p*'s > .05) (see Figure 6).

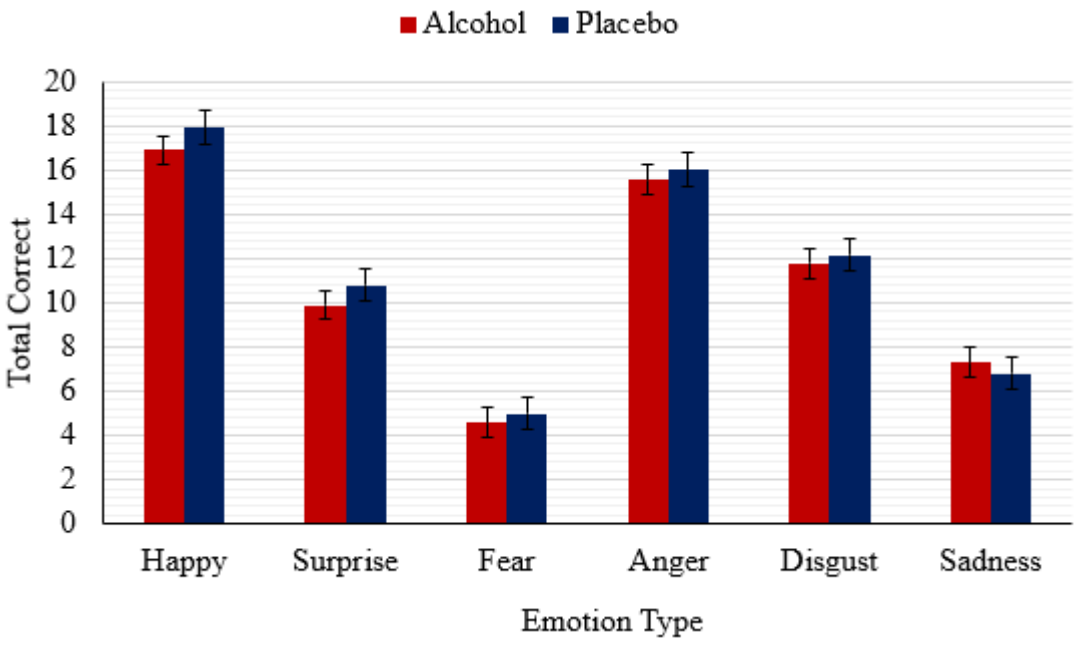

Figure 6. Results of emotion perception performance on the ERT task by Condition. Error bars represent standard errors.

TASIT-S Performance

A 2 condition x 4 item type x 4 subtest FIML mixed models analysis indicated a significant condition x subtest interaction, $F(1, 705) = 15.05$, $p = < .001$, $d = 1.16$, however no differences were seen across conditions $\alpha = .01$ (see Figure 7, for all comparisons see Appendix J). Within-subjects comparisons revealed no significant difference between *Part 2 sincere* and *Part 3 lies*, and between *Part 2 sarcasm* and *Part 3 sarcasm* within each condition.

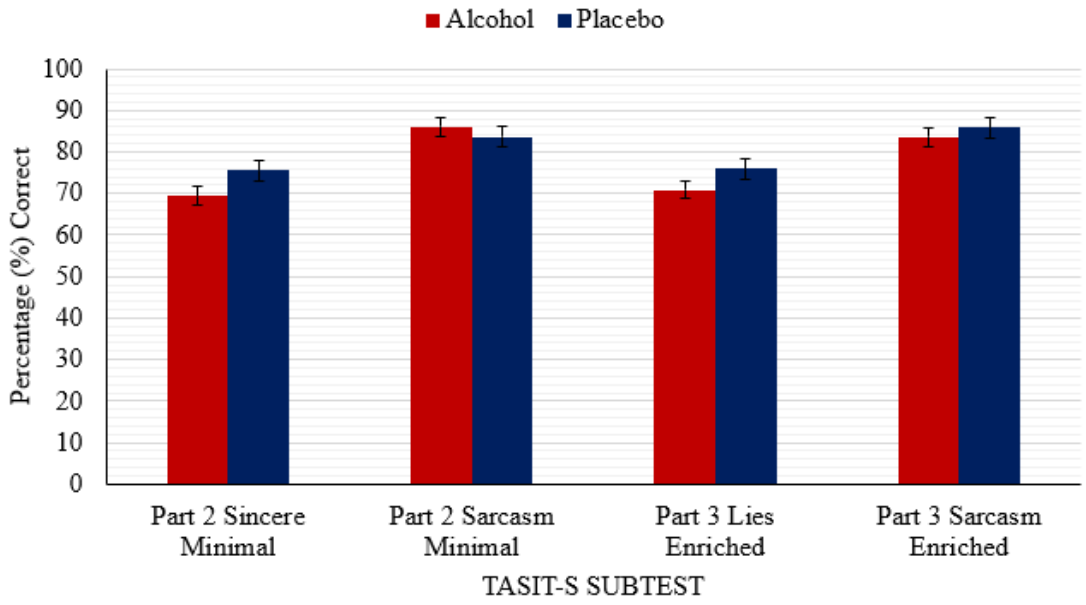

Figure 7. TASIT-S subtest performance by condition. Error bars represent standard error.

There was a significant condition x item type interaction, $F(6, 705) = 3.03$, $p = .006$, $d = 0.52$, however no post-hoc comparisons indicated differences across conditions for each item type (see Figure 8, or for comparisons Appendix J). A within-subjects comparison, however, indicated poorer performance for alcohol participants on item type *feel* compared to *do*, $F(3, 705) = 4.58$, $p = .001$, $d = 0.74$, *think*, $F(3, 705) = 4.58$, $p = .003$, $d = 0.65$, and *say*, $F(3, 705) = 4.58$, $p = .009$, $d =$

0.58. For the placebo condition, there were no significant differences across item types.

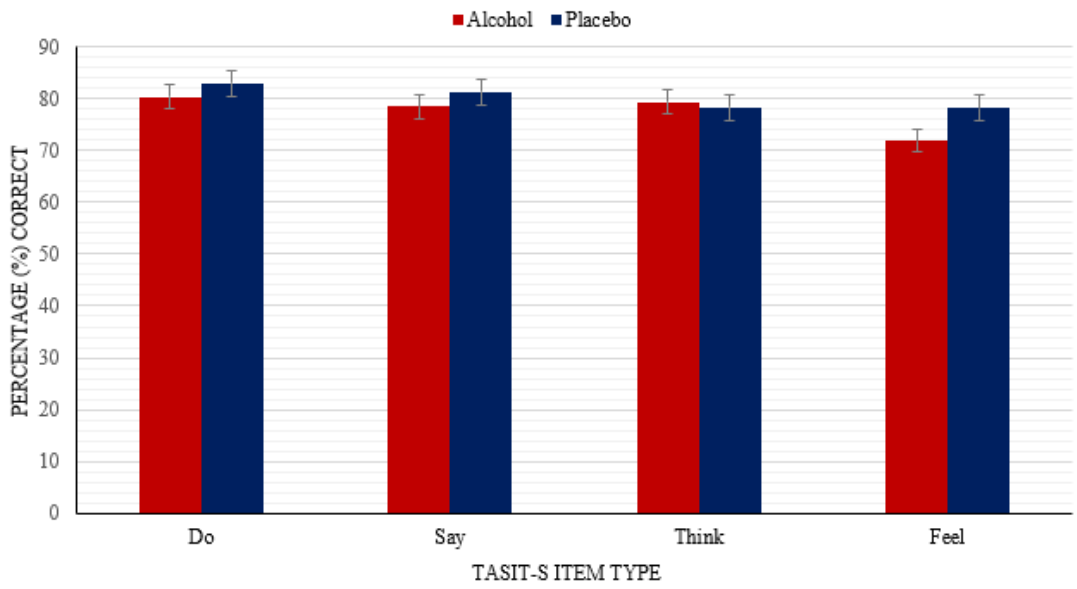

Figure 8. TASIT-S performance condition x item type interaction. Error bars represent standard error.

There was a 2 condition x 4 item type x 4 subtest interaction, $F(18, 705) = 5.46$, $p < .001$, $d = 0.70$ (see Figure 9, for all comparisons see Appendix J). Post-hoc comparisons indicated that alcohol participants were significantly less accurate in identifying how another person is *feeling* when they are telling *lies* in an *enriched* environment compared to placebo participants, $F(1, 605.15) = 12.16$, $p = .001$, $d = 1.04$. There was also a trend towards alcohol participants being less accurate than placebo participants at identifying how another person is *feeling* when they are being *sincere* in a *minimal* environment $F(1, 605.15) = 6.31$, $p = .012$, $d = 0.75$. No significant differences were found between conditions on the remaining item types and subtests ($\alpha = .01$ level).

A within-subjects comparison, however, indicated alcohol-intoxicated participants were significantly less accurate identifying what another person is *doing*

when they are being *sincere* in a *minimal environment* compared to when they are telling *lies* in an *enriched environment* $F(1, 605.15) = 12.16$, $p = .001$, $d = 1.02$, and also significantly less accurate identifying how another person is *feeling* when they are being *sarcastic* in an *enriched environment* compared to a *minimal environment* $F(3, 705) = 19.77$, $p = .010$, $d = 0.51$. There was trending lower performance for alcohol participants on *Part 2 sarcasm think* items compared to *Part 3 sarcasm think* items $F(3, 705) = 19.77$, $p = .023$, $d = 0.45$, and on *Part 3 lies feel* items compared to *Part 2 sincere feel items* $F(3, 705) = 19.77$, $p = .023$, $d = 0.45$. A similar effect was also present for placebo participants. No other within-subject differences were detected in the three-way interaction.

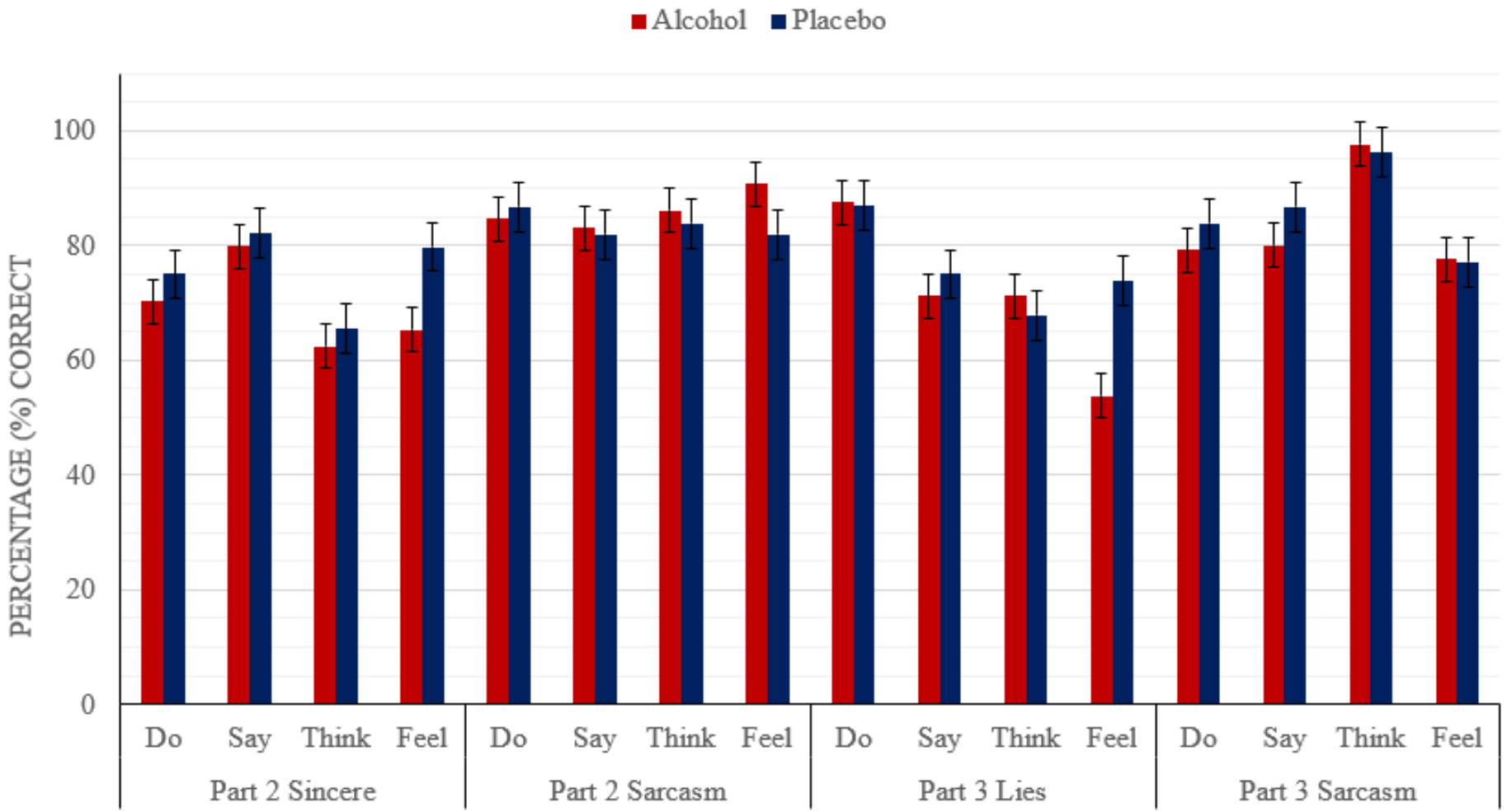

Figure 9. Results of TASIT-S condition x item type x subtest interaction. Error bars represent standard error.

Calibration Analyses

Overall Accuracy of Confidence Rating

One samples *t*-tests indicated that the overall Calibration statistic for alcohol (*M* = 0.04, *SD* = 0.02) and placebo (*M* = 0.03, *SD* = 0.02) conditions were significantly different from zero, $t(25) = 7.39$, $p < .001$, 95%CI [0.03, 0.04], and $t(20) = 7.70$, $p < .001$, 95%CI [0.02, 0.04], respectively. A significant Calibration statistic indicated that actual performance of alcohol and placebo conditions did not correspond with subjective appraisal ratings of performance.

One samples *t*-tests indicated that overall ANDI values for alcohol (*M* = 0.08, *SD* = 0.09) and placebo (*M* = 0.12, *SD* = 0.12) conditions were significantly different from zero, $t(25) = 4.66$, $p < .001$, 95%CI [0.04, 0.12], and $t(20) = 4.58$, $p < .001$, 95%CI [0.07, 0.18], respectively. One sample *t*-test was not performed for the O/U statistic given this statistic contains both positive and negative values and there is no expectation this value will be different from zero.

Effect of Alcohol on Metacognitive Awareness Accuracy TASIT-S (Parts 2 & 3)

Calibration Statistic

A 2 condition x 4 item type x 4 subtest FIML mixed models analysis revealed a significant condition x subtest interaction, $F(6, 705) = 18.55$, $p < .001$, $d = 1.29$ (see Figure 10). Post-hoc pairwise comparisons revealed significantly higher Calibration statistic for alcohol compared to placebo participants on *Part 2 sincere* subtest, $F(1, 206.43) = 9.62$, $p = .002$, $d = 0.93$, and also a strong tend towards significance in Part 3 *lies*, $F(1, 206.43) = 6.65$, $p = .011$, d = 0.77. Within-subjects pairwise comparisons revealed there to be no significant difference between *Part 2 sincere* and *Part 3 lies*, and between *Part 2 sarcasm* and *Part 3 sarcasm* within each condition (for all comparisons see Appendix K).

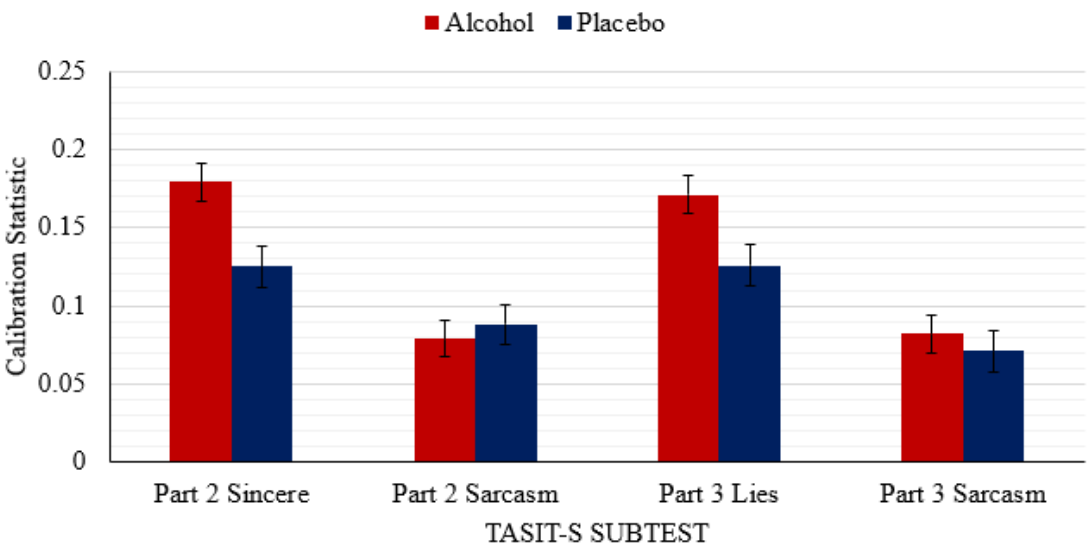

Figure 10. Results for calibration statistic for condition x subtest interaction. Error bars represent standard error.

There was also a condition x item type interaction, $F(6, 705) = 5.38$, $p < .001$, $d = 0.69$ (see Figure 11). Post-hoc pairwise comparisons indicated significantly higher Calibration values for alcohol participants on item type *feel*, $F(1, 206.43) = 5.77$, $p = .017$, $d = 0.72$. There was also a strong trend towards higher calibration values for alcohol compared to placebo participants on item type *think*, $F(1, 206.43) = 4.80$, $p = .030$, $d = 0.65$. Within-subjects comparisons revealed significant higher Calibration values in the alcohol condition on item type *think* compared to item types *do*, $F(3, 705) = 7.49$, $p = .001$, $d = 0.78$, *say*, $F(3, 705) = 7.49$, $p = < .001$, $d = 1.03$, and *feel* $F(3, 705) = 7.49$, $p = .001$, $d = 0.73$. For the placebo condition there were significantly higher Calibration values on item type *think* compared to *feel* $F(3, 705) = 3.28$, $p = .002$, $d = 0.82$. No other pairwise comparisons were significant.

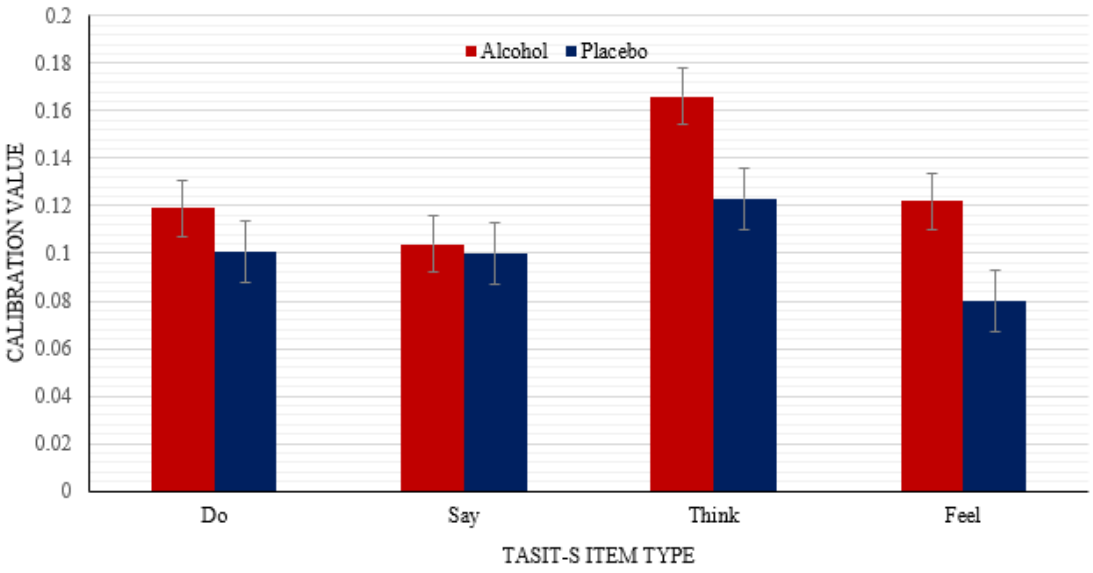

Figure 11. Results of calibration statistic condition x item type interaction. Error bars represent standard error.

There was a significant condition x item type x subtest interaction, $F(18, 705) = 3.03$, $p < .001$, $d = 0.52$ (see Figure 12). Post-hoc pairwise comparisons showed significantly higher calibration statistic values for alcohol compared to placebo participants on *Part 2 sincere feel* items, $F(1, 676.13) = 15.13$, $p < .001$, $d = 1.16$, and also on *Part 3 lies think* items, $F(1, 676.13) = 12.10$, $p = .001$, $d = 1.04$. There was also a trend towards significant high Calibration values for the alcohol compared to placebo participants on *Part 3 lies feel* items $F(1, 676.13) = 4.84$, $p = .028$, $d = 0.62$.

Within subjects comparisons, however, indicated significantly higher calibration statistic for alcohol participants when detecting how another person is *feeling* when they are being *sincere* in a *minimal environment* compared to when they are telling *lies* in an *enriched environment* $F(3, 705) = 11.95$, $p = .005$, $d = 0.72$. There was also a strong trend towards higher calibration statistic for alcohol participants identifying what another person is *saying* when they are being *sarcastic*

in a *minimal environment* compared to an *enriched environment* $F(3, 705) = 6.73$, $p = .012$, $d = 0.67$. For placebo participants, there was significantly higher calibration statistic identifying what another person is *saying* when they are being *sarcastic* in a *minimal environment* compared to an *enriched environment* $F(3, 705) = 5.64$, $p = .006$, $d = 0.78$. No other within-subject differences were detected in the three-way interaction.

O/U Statistic

A 2 condition x 4 item type x 4 subtest FIML mixed models analysis for overall O/U statistic values revealed a significant condition x subtest interaction, $F(6, 705) = 7.04$, $p < .001$, $d = 0.80$. However, post-hoc analyses (between and within-subjects) revealed no significant differences between subtests. There was no significant condition x item type interaction, $F(6, 705) = 1.05$, $p = .394$, $d = 0.31$. There was a significant condition x subtest x item type interaction, $F(18, 705) = 3.54$, $p < .001$, $d = 0.56$. Post-hoc pairwise comparisons showed there to be significant differences between the alcohol and placebo conditions in *Part 3 lies feel* items $F(1, 360.17) = 9.02$, $p = .003$, $d = 8.95$, with the alcohol condition showing higher overestimation (see Figure 13).

Within-subjects comparisons, however, revealed alcohol participants overestimated performance on *Part 3 lies say* items compared to *Part 2 sincere say* items $F(3, 705) = 4.13$, $p = .001$, $d = 0.12$. The same trend also appeared in the placebo condition, with significant differences found $F(3, 705) = 2.75$, $p = .005$, $d = 0.79$. Alcohol participants also overestimated performance on *Part 3 lies feel* items compared to *Part 2 sincere feel* items $F(3, 705) = 11.30$, $p = .003$, $d = 0.76$, and also overestimated performance on *Part 3 sarcasm feel* items compared to *Part 2*

sarcasm feel items $F(3, 705) = 11.31$, $p = .008$, $d = 0.69$. No other within subject pairwise comparisons were significant (for all comparisons see Appendix L).

ANDI Statistic

A 2 condition x 4 item type x 4 subtest FIML mixed models analysis for the ANDI statistic indicated a significant condition x subtest interaction, $F(6,451.89) = 3.78$, $p = .001$, $d = 0.58$. However, post-hoc analysis revealed no significant difference between groups (all *p*s > .01). Within-subjects comparisons revealed no significant difference on ANDI statistic between *Part 2 sincere* and *Part 3 lies*, and between *Part 2 sarcasm* and *Part 3 sarcasm* for the alcohol condition. However, for the placebo condition there was a significant difference between *sincere minimal* and *lies enriched* ($p = .001$), and no significant difference between *sarcasm Part 2 minimal* and *Part 3 enriched*. There was no significant condition x item type interaction, $F(6, 438.69) = 2.08$, $p = .055$, $d = 0.43$.

There was no significant three-way condition x item type x subtest interaction, $F(18, 439.57) = 1.14$, $p = .315$, $d = 0.32$. Within-subject comparisons, however, indicated significantly lower ANDI statistic values for alcohol participants on *Part 3 lies do* items compared to *Part 2 sincere do* items $F(3, 436.73) = 5.28$, $p = .002$, $d = 7.72$. There was also the same trend for placebo participants $F(3, 434.82) = 5.40$, $p = < .001$, $d = 9.48$. No other pairwise comparisons were significant (for all comparisons see Appendix M).

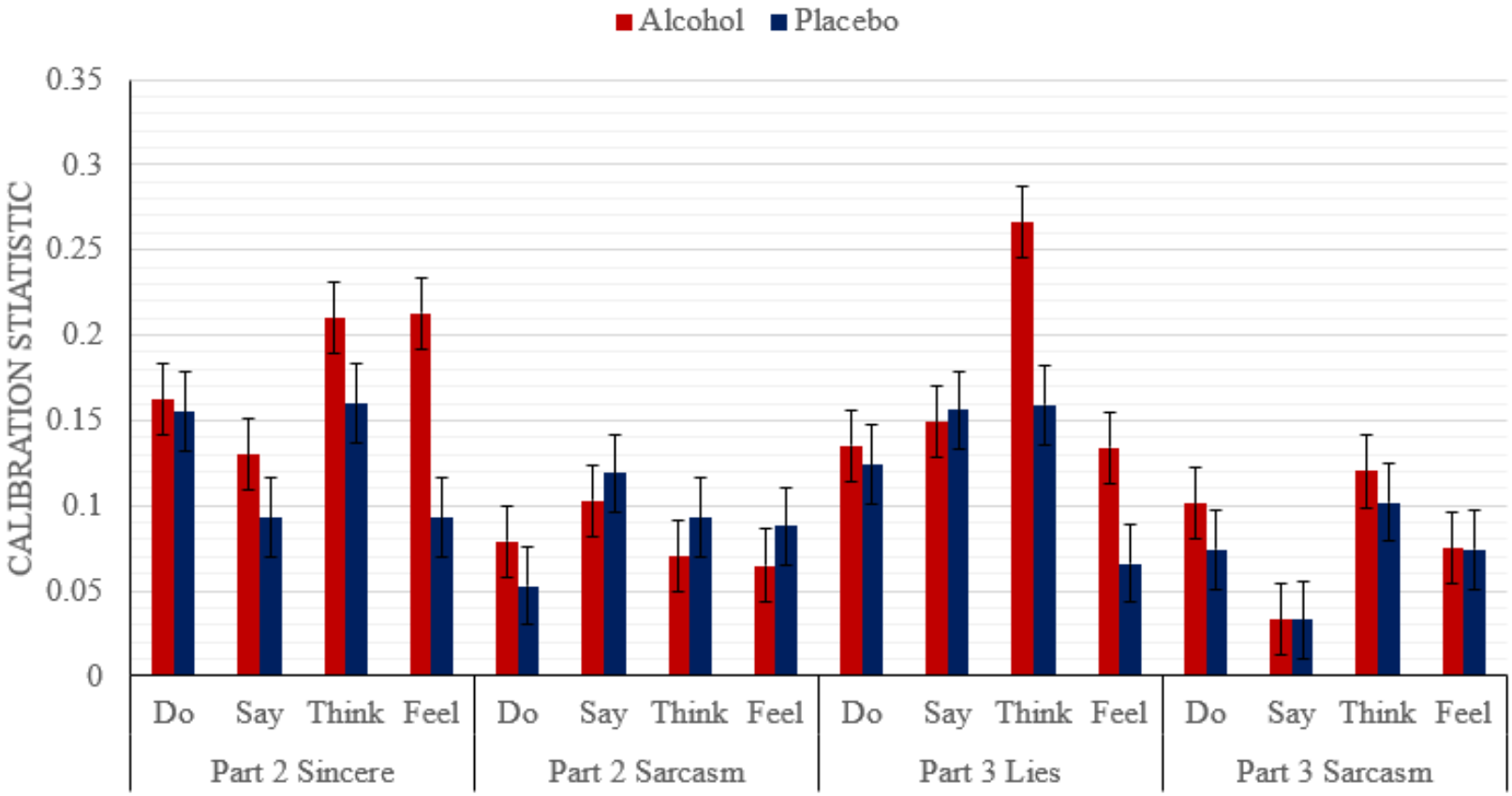

Figure 12. Results of TASIT-S Calibration Statistic for Condition x Item Type x Subtest interaction. Error bars represent standard error.

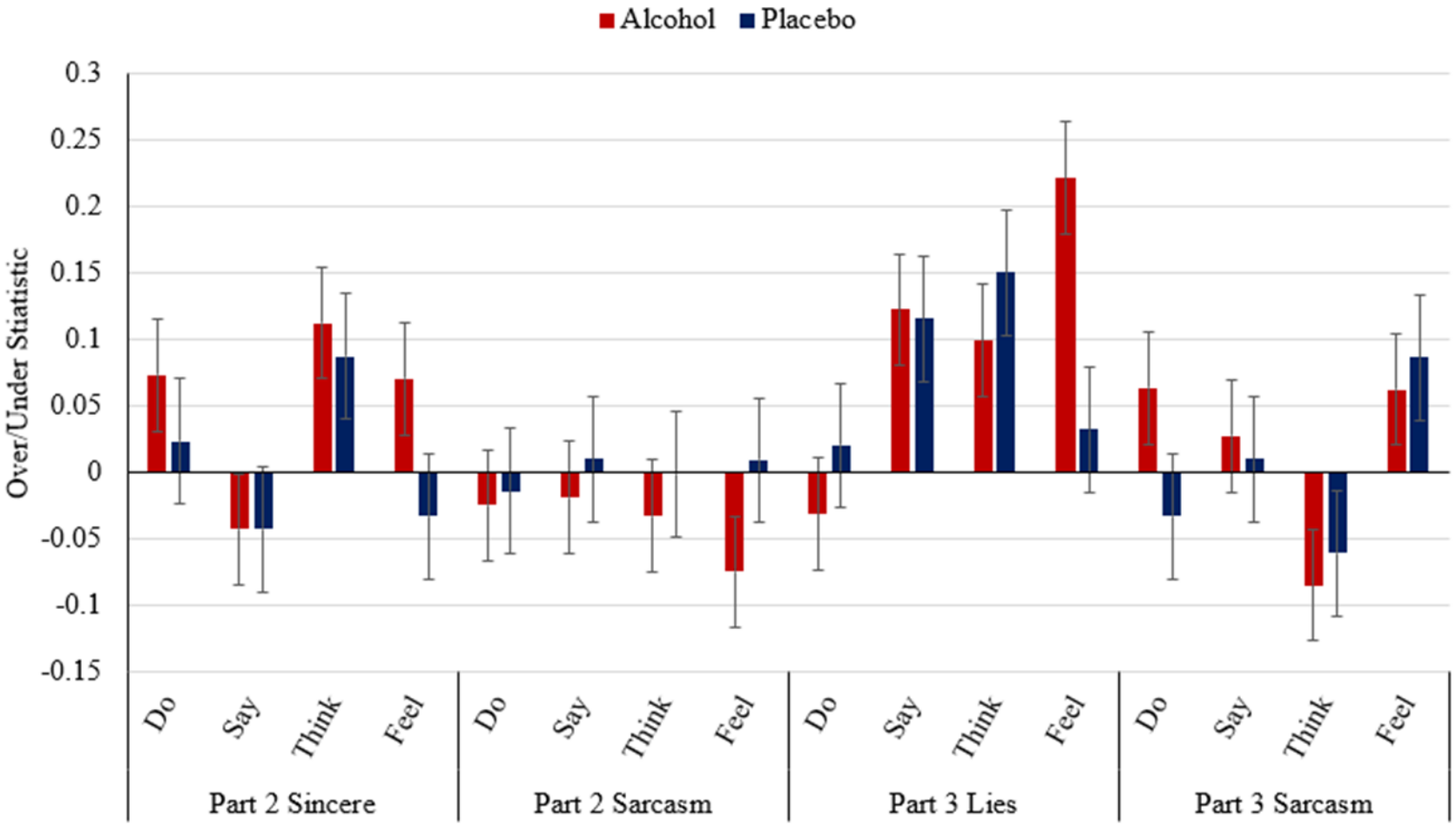

Figure 13. Results for Over- Under-Confidence Statistic Condition x Item Type x Subtest. Error bars represent standard error.

Discussion

The current study investigated the effects of acute high-dose alcohol-intoxication on the ability to comprehend sarcasm across minimal and maximally enriched environmental conditions and across four probing question types that assess a person's ability to perceive what another person is doing, saying, and thinking (assessing cognitive aspects of ToM) or feeling (assessing affective aspects of ToM). The effect of acute high-dose alcohol-intoxication on metacognitive judgements (insight) of these abilities were also examined.

The prediction, that intoxicated individuals would experience greater difficulty comprehending sarcasm compared to non-intoxicated individuals, was not supported. Contrary to predictions, the current study did not demonstrate any differences between alcohol and placebo conditions on performance on tasks requiring the detection of sarcasm when sarcasm was present. However, alcohol-intoxicated participants were impaired in the detection of more direct communication exchanges (i.e., with no sarcasm present in items containing sincere exchanges or lies) but only in relation to affective ToM (i.e., *feel* items). That is, no impairment was seen in cognitive ToM items (*do, say, think*). These results are somewhat consistent with findings of Mitchell et al. (2011) who also found impairments on a ToM task, the *Reading the Mind in the Eyes* task, that is thought to involve affective aspects of ToM. Although it is not consistent with respect to Mitchell's findings of an impairment for alcohol-intoxicated participants on the *Faux Pas* task, which may arguably tap into more cognitive aspects of ToM (i.e., picking up on a socially awkward interaction). This discrepancy between the results of this study and Mitchell's study may be due to the high verbal requirement of *Faux Pas* tasks.

Specifically, participants are asked to read lengthy vignettes and answer several questions. Thus, ToM impairments may be difficult to distinguish from reading comprehension impairments. The *Eyes Task* has been criticised by Johnston, Miles and McKinley (2012) as not being a ToM task, but rather a task of rational elimination. Notably, Johnston et al. (2012) argues that impaired performance is perhaps not a consequence of the inability to perceive another's psychological state, but could be the consequence of inferred social norms, or stereotypical beliefs from *The Eyes Task* designers, as it is possible that the stimuli for *The Eyes Task* were cut out of magazines, whereby an emotional state was allocated to the images without the knowledge of the person within the image. Despite the criticisms of Johnston, the current results do add support for these prior findings using this task. Our results were also inconsistent with the findings of Dolder et al. (2016) who found that intoxicated individuals have enhancements to positive stimuli. One possible explanation for the differential support for our findings may be attributed to the dissimilar experimental manipulations employed by each study, which arguably tap differing aspects to ToM ability.

The unique impairment for affective ToM may be explained by the differential neurological processes that may mediate the affective and cognitive aspects of ToM. Recent evidence from lesion studies suggests an anatomical and behavioural double dissociation between emotional empathy (inferior temporal gyrus), and cognitive empathy (or affective ToM; ventromedial PFC) (Shamay-Tsoory, Aharon-Peretz, & Perry, 2009). There are many shades of 'grey' when differentiating whether a speaker is being totally sincere, such as if someone enthusiastically says: "*nice pants!*" compared with obvious insincerity, such as if someone says: "*nice pants!*" as a sarcastic retort. Speakers may choose to use

identical words; however, it is the sincerity or explicitness (alternatively sarcasm) within the utterance that provides nuance to the speaker's intentions, requiring intact ToM for interpretation. Such differences may be reflected in underlying neurological processes and may underpin the differences seen in the present study. For example, when detecting and interpreting sarcasm (and pragmatic understanding generally), the neuroanatomical structures involved include the right temporal parietal junction and insula, medial and ventromedial PFC, and OFC (Adolphs, 1999; Eslinger, 1998; McDonald, 1999; Shamay et al., 2005; Uchiyama et al., 2006). In contrast, comprehending sincerity/lies (i.e., more direct exchanges) are mediated by the neuroanatomical regions involved include the anterior temporal and left inferior frontal gyrus (involved in mediating semantic knowledge about social norms), rostromedial PFC (involved in reasoning regarding genuine/deceptive acts), bilateral temporoparietal junction, right superior temporal sulcus, left dorsolateral PFC (detecting intent to deceive; Harada et al., 2009), and left insula (for sincerity) (Rigoulot, Fish, & Pell, 2014). Gorka et al. (2013) has identified the potential of alcohol to 'decouple' functional connectivity between the amygdala and PFC during the processing of socio-emotional stimuli. It is possible that differential effects of acute alcohol-intoxication on these varying brain structures and networks (i.e., heavily impacting the brains emotional regions) may underpin the disparity identified in our findings.

An interesting finding in the current study was the tendency for poorer performance in alcohol-intoxicated participants (i.e., when compared to placebo participants) in the environmentally enriched affective ToM items as indicated by the relatively higher effect size for the between group analysis compared to that found in a minimally enriched condition. This seemingly greater impairment in *enriched*

environments is consistent theoretically with the Alcohol Myopia Model (AMM; Steele & Josephs, 1990), which contends that alcohol has a myopic effect on attentional resources, resulting in deficits to perceptual function and errors in processing cues (Giancola et al., 2010). However, caution must be maintained with this interpretation do the lack of within-subject difference found across the environmentally enriched and minimally enriched item types. This lack of within subject effect may be due to the TASIT-S being primarily comprised a greater number of question items tapping cognitive ToM (*do, say, think*) rather than affective ToM (*feel*). This imbalance in sensitivity incorporated within TASIT-S item types may possibly explain the differential outcomes seen across *minimal* and *enriched* environments. Furthermore, even in the minimally enriched items of the TASIT-S, there is an element of environmental enrichment by nature of their being a dynamic interaction being depicted between two individuals. This dynamic interaction includes variable facial expressions, body language, and additional personal features of the characters. Thus, it may be concluded here that the extent of environmental enrichment may have interacted in a manner consistent with the AMM. Future research could compare differing intensity levels of environmental enrichment on the ability of acutely-intoxicated individuals to detect sarcasm/sincerity/lies using a broader range of affective ToM items.

A further aim of the current study was to examine metacognitive judgements of sarcasm detection ability. Metacognitive functioning is argued to be a fundamental conduit between social cognitive ability and successful social interaction (Koren et al., 2006). The prediction that intoxicated-participants would demonstrate a greater lack of insight into sarcasm detection abilities compared to placebo participants was partially supported. The current study demonstrated

intoxicated individuals had significantly impaired insight into their ability to comprehend if someone is being *sincere* (in a *minimal* environment), with a strong trend also detected for impaired insight into their ability to comprehend when someone is telling *lies* (in an *enriched* environment). While future metacognitive research into acute-alcohol-intoxication utilising a larger sample may further clarify the findings from the current study, it is clear that there is some reduced insight into sarcasm comprehension ability in alcohol-intoxicated participants.

The tendency to over- or under-estimate their metacognitive judgements regarding subtest (*sarcasm/sincerity/lies)* and item type (*do*, *say*, *think*, *feel*) was also examined. The results were partially consistent with expectations – that intoxicated participants would over-estimate their performance. Most notably it was found that intoxicated-individuals were significantly over-confident in their metacognitive judgements when comprehending how someone is *feeling* when they are telling *lies* (in an *enriched* environment). On *feel* item types, there was an overall pattern of over-confidence in *enriched environments* compared to *minimal environments* (i.e., *lies Part 3*/*sincere Part 2*, and *sarcasm Part 3*/*sarcasm Part 2*) in alcohol intoxicated participants.

Reduced insight into social cognitive abilities, combined with deficits in actual ability, may present real challenges for alcohol-intoxicated individuals when attempting to engage in social communication, in which intact self-monitoring, reflexivity of self-behaviours, and self-control behaviours are paramount (Lories, Dardenne, & Yzerbert, 1998; Salonen Vauras, & Efklides, 2005; Efklides, 2008). For instance, if one is impaired, effective metacognitive monitoring is required in order for behavioural responses to be appropriately corrected. Therefore, without

effective self-monitoring, of which insight is fundamental, a person will not be able to adjust their response so that they are more socially appropriate.

This study used the BAES to ensure the alcohol manipulation performed as intended. The BAES is a self-report measure assessing the subjective *stimulant* and *sedative* effects of alcohol consumption. This study found increased sedative effects for intoxicated participants from baseline, pre-ERT, pre-TASIT-S, and post-TASIT-S. One possible explanation for the increased sedation effect among alcohol participants is the high-dose administration of alcohol (approximately six standard alcoholic drinks, around .08% BrAC) which is thought to produce such sedative effects (Hendler, Ramchandani, Gilman, & Hommer, 2011). No differences in stimulation was found during TASIT administration across alcohol and placebo conditions. While this may indicate the placebo condition was effective in this study, it is also likely a reflection of the high-dose alcohol administration. A low-dose intoxication experimental paradigm may have produced higher stimulant effects (Hendler et al., 2011). Therefore, the sedative effects of acute alcohol-intoxication were perhaps a factor influencing the present results. Indeed, given the possible effects that feeling stimulated or sedated would produce on social cognitive functioning, future research could compare the effects of multiple BrAC levels (i.e., both *stimulant* and *sedation*) effects on the ability to detect sarcastic, sincere, and/or explicit communication exchanges.

It may be considered the effects of acute alcohol-intoxication disrupts brain processes more intermittently, rather than having the effect of a severe impairment or deficit. In view of this, TASIT-S may not have been a sensitive enough instrument for detecting subtle differences in an acutely-intoxicated sample. This is because TASIT-S was designed for use with clinical samples with more extensive mediation

of underlying neuropathology (i.e., TBI, stroke, autism). Indeed there appeared ceiling effects present in the sarcasm subtests (i.e., participants in both conditions performed at near ceiling levels, despite there being evidence of adequate variability). TASIT-S was designed as a criterion-referenced test for clinical samples where ceiling effects on healthy populations is expected (McDonald, Flanagan, & Rollins, 2011). At the present time, TASIT is the only available measure that assesses sarcasm detection ability. However, future development of similar measures with more sensitivity may allow potential impairments regarding alcohol-intoxication and sarcasm detection ability to be more thoroughly examined.

Alcohol expectancy effects may be a further limitation of this study. Given placebo participants reported that they too consumed a significant quantity of alcohol, it is possible that placebo participants also experienced altered performance on TASIT-S (Fillmore & Vogel-Sprott, 1995; Testa et al., 2006). It is known that the expectation of consuming an intoxicating substance for individuals can be a driving force in shaping conscious expectations (Testa et al., 2006). The adoption of a placebo condition as the comparison group, rather than a non-placebo control condition, nonetheless reduced any potential influence of expectation effects.

With well-established links between acute alcohol-intoxication and negative social behaviours, the findings from this study have important social implications. The current study adds new information to the existing body of evidence, which has demonstrated impairments to ToM ability with acute-alcohol-intoxication. This study demonstrated that acutely intoxicated individuals have reduced abilities in affective aspects of ToM when required to differentiate sincere or explicit exchanges from sarcastic exchanges, and have reduced insight regarding their sarcasm detection abilities. This combination of impaired ability and reduced meta-cognitive

functioning is concerning, given that in difficult social situations involving alcohol-intoxication there is the possibility for individuals to misinterpret their abilities and likely inadvertently leading to an inability to produce socially acceptable responses. These findings provide new insight into the underlying mechanisms of acute alcohol-intoxication and negative social behaviours, and can be used to inform consumers of alcohol of the risks involved in acute-intoxication of the role that impaired ToM may play in negative social behaviours.

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Appendix A Ethics Approval

Office of Research Services
University of Tasmania
Private Bag 1
Hobart Tasmania 7001
Telephone + 61 3 6226 7479
Facsimile + 61 3 6226 7148
Email Human.Ethics@utas.edu.au
www.research.utas.edu.au/human_ethics/

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

UTAS

17 May 2016

Dr Cynthia Honan
C/o- Psychology

Sent via email

Dear Dr Honan

REF NO: H0015633
TITLE: Alcohol intoxication and social cognition: an examination of perception and response to social information

Document
Application Form – NEAF
Protocol – Alcohol Study
Psychology Peer Review

The Tasmanian Health and Medical Human Research Ethics Committee considered and approved the above documentation on **10 May 2016** to be conducted at the following site(s):

University of Tasmania

Please ensure that all investigators involved with this project have cited the approved versions of the documents listed within this letter and use only these versions in conducting this research project.

This approval constitutes ethical clearance by the Health and Medical HREC. The decision and authority to commence the associated research may be dependent on factors beyond the remit of the ethics review process. For example, your research may need ethics clearance from other organisations or review by your research governance coordinator or Head of Department. It is your responsibility to find out if the approvals of other bodies or authorities are required. It is recommended that the proposed research should not commence until you have satisfied these requirements.

All committees operating under the Human Research Ethics Committee (Tasmania) Network are registered and required to comply with the *National Statement on the Ethical Conduct in Human Research* (NHMRC 2007 updated 2014).

Therefore, the Chief Investigator's responsibility is to ensure that:

(1) The individual researcher's protocol complies with the HREC approved

protocol.

(2) Modifications to the protocol do not proceed until **approval** is obtained in writing from the HREC. Please note that all requests for changes to approved documents must include a version number and date when submitted for review by the HREC.

(3) Section 5.5.3 of the National Statement states:

Researchers have a significant responsibility in monitoring approved research as they are in the best position to observe any adverse events or unexpected outcomes. They should report such events or outcomes promptly to the relevant institution/s and ethical review body/ies and take prompt steps to deal with any unexpected risks.

The appropriate forms for reporting such events in relation to clinical and non-clinical trials and innovations can be located at the website below. All adverse events must be reported regardless of whether or not the event, in your opinion, is a direct effect of the therapeutic goods being tested. http://www.utas.edu.au/research-admin/research-integrity-and-ethics-unit-rieu/human-ethics/human-research-ethics-review-process/health-and-medical-hrec/managing-your-approved-project

(4) All research participants must be provided with the current Patient Information Sheet and Consent Form, unless otherwise approved by the Committee.

(5) The Committee is notified if any investigators are added to, or cease involvement with, the project.

(6) This study has approval for four years contingent upon annual review. A *Progress Report* is to be provided on the anniversary date of your approval. Your first report is due **10 May 2017.** You will be sent a courtesy reminder closer to this due date.

(7) A *Final Report* and a copy of the published material, either in full or abstract, must be provided at the end of the project.

Should you have any queries please do not hesitate to contact me on (03) 6226 2764.

Yours sincerely

Heather Vail
Ethics Administrator
Office of Research Services
Email: Heather.vail@utas.edu.au
University of Tasmania
Private Bag 01 Hobart Tas 7001

Appendix B Notification of Amendment Approval H0015633

Notification of Amendment Approval: H0015633 Alcohol intoxication and social cognition: an examinati

Research Ethics
Wed 5/10/2017 10:20 AM

To: Cynthia Honan;
Cc: Emma Johnson; Sarah Skromanis; Stefania Franja; Research Ethics;

Dear Dr Honan

Ethics Ref: H0015633
Title: Alcohol intoxication and social cognition: an examination of perception and response to social information

This email is to confirm that the following amendment was approved by the Chair of the Tasmania Health and Medical Human Research Ethics Committee on 10/5/2017:

Amendment Additional brief questionnaire
Miscellaneous Questionnaire Narcissistic Personality Inventory
Application Form NEAF - revised
Information Sheet PICF 2017
Amendment Additional Associate Researchers - Ms Stefania Franja, Miss Carly James and Mr Jason Turner

All committees operating under the Human Research Ethics Committee (Tasmania) Network are registered and required to comply with the National Statement on Ethical Conduct in Human Research (NHMRC 2007).

This email constitutes official approval. If your circumstances require a formal letter of amendment approval, please let us know.

Should you have any queries please do not hesitate to contact me.

Kind regards

Heather Vail

--
Heather Vail
Ethics Officer
Office of Research Services
University of Tasmania
Private Bag 01
Hobart TAS 7001
Phone: (03) 6226 6254
Fax: (03) 6226 2765
Email: Heather.Vail@utas.edu.au
Web: http://www.utas.edu.au/research-admin

Appendix C Participant Recruitment Flyer

Research Volunteers Wanted

Alcohol and Social Ability Study

Are you aged between 18-35 years?

Do you have some experience with alcohol?

We are looking for healthy volunteers to participate in a study investigating the effects of alcohol on social abilities such as emotion perception.

As a participant you will be asked to complete some brief baseline assessment tasks and questionnaires, consume some beverages (which may contain alcohol), and undertake some computer-based assessment tasks. The testing should take no longer than 2 hours to complete, although you must remain with the researchers until a BrAC level of .03% is achieved (0.0% for provisional licence drivers).

To volunteer or for more information, please email alcoholstudylaunceston2017@gmail.com

Receive a Village Cinemas movie ticket

This study has been approved by the Tasmanian Health and Medical Human Research Ethics Committee (#H0015633)

Appendix D Follow-up Screening Interview

Introduction to the Study and Screening

I am following up your expression of interest in the research examining alcohol and social cognition. Are you still interested in participating in the research?

To give you a quick summary of the research, your participation will involve attending a one 2 hour session, however you may be required to remain with the researchers 3 hours to ensure you return to a baseline blood alcohol reading before leaving. In the session, you may or may not be administered alcohol; you won't be informed of the beverage type administered in each session until the end of your participation. You will be asked to complete some non-computer-based and computer-based tests of cognition. You will also rate your level of intoxication. Blood alcohol concentration will be measured throughout the session. KHA11/112 participants will receive 3 hours of course credit for their participation. Non-KHA111/112 participants will receive a movie ticket in appreciation of their time.

Do you have any initial questions about the research?

Do you mind if I ask you a few quick questions to check your eligibility for participating in the study? *Review the answers provided in the initial online screen. Inform the participant that all information will be kept confidential and this screening questionnaire will be securely destroyed at the conclusion of your participation.*

Specification of Study Restrictions

I would just like to ask you a few extra questions to ensure you will be able to complete the study. *(Exclude if answer no to any of the following questions).*

- Will you be able to attend one 100 minute session held within the Discipline of Psychology at the Launceston campus of the University of Tasmania and conducted between 9:00am and 7:00pm?
  Y / N
- Are you willing to remain in the laboratory until your blood alcohol concentration equals 0.03% or less on two consecutive occasions measured 15 minutes apart? This may mean being the laboratory for around 3 hours in total? **Y / N**

- Are you willing to drink up to six standard alcoholic drinks in the session? **Y / N**

- In order to ensure participants enter each experimental session with the same level of alcohol, caffeine and food in the stomach, we ask that participants abstain from food for 4 hours, caffeine for 8 hours and alcohol and over-the-counter medication for 24 hours prior to each session. We also ask that participants abstain from illicit drugs for the duration of the study. Participants are also required to eat 2 slices of toast with spread of choice 1 hour prior to the session. This will be available from the researchers if required. Prior to fasting a light meal devoid of high fat and dairy is advised (e.g., a sandwich). Will you be willing to abstain from food, alcohol, caffeine, and illicit drugs for the specified durations? **Y / N**

Thank you for answering all the questions. Do you have any further questions about the research? (Note any concerns _____)

I will email you some information about what to do before attending an experimental sessions. I will also send you instructions and a map to assist in finding the laboratory.

Do you have any preferred days for completing the experimental session?

- □ Monday
- □ Tuesday
- □ Wednesday
- □ Thursday
- □ Friday
- □ Saturday
- □ Sunday

Do you have a time and day that would be convenient to come and complete the session?

Date: / / Time:

I will send you a reminder the day before the session. Would you prefer me to call/text/email the day before to confirm your session?

call/text/email *(circle)*

Mobile: ……

email: ……..

** Emailed pre-session instructions to the participant: YES / NO *(circle)*

Appendix E Participant Information Sheet

School of Psychology
University of Tasmania

Information Sheet

The Impact of Alcohol Consumption on Social Ability

March 2017

Introduction

You are invited to participate in an experiment examining the effect of alcohol on social ability. The research is being conducted by Dr Cynthia Honan and Dr Matt Palmer. Assisting with the study are Research Assistants Miss Sarah Skromanis and Mrs Stefania Franja. Miss Carly James and Mr Jason Turner will also be assisting as partial fulfilment of the requirements of an Honours degree at the University of Tasmania. Carly and Jason are being supervised by Dr Cynthia Honan, a Clinical Neuropsychologist and Lecturer from the Discipline of Psychology, School of Medicine, University of Tasmania.

What is the purpose of the study?
The purpose of this study is to investigate how alcohol interferes with social ability. Emotion perception and theory of mind ability (ability to understand the thoughts and behaviours of others), and the ability to inhibit automatic social responding will be specifically examined. These abilities will be assessed using cognitive tasks.

Who can participate?
We are seeking participants who are:

- Aged 18-35 years
- Speak and read fluent English
- Completed Year 10 or equivalent
- Normal or corrected-to-normal vision
- Healthy (no history of significant neurological disorder or current psychiatric disorder, significant intellectual disorder, alcohol/drug dependence, regular tobacco use, or chronic health problems)
- Regular alcohol consumers (minimum consumption of 2 standard alcoholic drinks on one occasion in the preceding month)
- Not currently using illicit drugs (i.e. use in the past six months)
- Not taking prescription medication (contraceptive medication allowed)

- Able to attend the Newnham campus of the University of Tasmania for 3 hours between 9am and 7pm (session lengths are an estimate only).

What does participation in the study involve?
This research will be conducted in Buildings O and N at the Newnham Campus, University of Tasmania. Interested individuals will complete some online screening questionnaires that will ask for your demographic details (e.g., age, sex, education), height and weight (to calculate Body Mass Index), medical history, psychological functioning, and use of alcohol. Eligible participants will be contacted to attend the Newnham campus for an experimental session conducted between 9am and 7pm.

Experimental sessions:
At the beginning of the session participants will consume a 150ml beverage before completing questionnaires asking about alcohol intake in the previous month, current mood, and brief cognitive tasks assessing basic emotion perception and inhibition ability. Participants will then be asked to consume a 750ml beverage that will contain either a placebo or alcohol. Alcohol administered will be a maximum of 6 standard alcoholic drinks. Participants will not be informed of the beverage content administered in each session until the conclusion of the session.

After consuming the beverage, participants will be asked to complete an emotion recognition task, and either tasks assessing inhibition ability or the ability to understand the thoughts and intentions of another person (theory or mind). A breathalyser will be used to monitor participants' breath alcohol concentration throughout the duration of the study. Throughout testing, participants will also be asked to complete several scales assessing their feeling of intoxication and impairment.

While it is estimated that the experimental tasks will take approximately 100 minutes to complete, some participants may be required to remain in the laboratory for a total of 3 hours to ensure each participant records two consecutive breath alcohol readings of .03% or less (.00% for Provisional licence holders intending to drive). These times are an estimate only as individual rates of alcohol absorption and elimination may vary. Participants will be debriefed regarding the order of dose administration at the conclusion the session.

What are the restrictions regarding participating?
Participants will be asked to fast from food for 4 hours prior to each experimental session, although we ask that participants consume two slices of toast with their choice of spread 60 minutes prior to the session. Toast will be available from the researchers if required. Prior to fasting, a standard light meal devoid of high-fat or dairy products (e.g., a sandwich) is advised.

Participants will be asked to abstain from caffeine for 8 hours and alcohol and over-the-counter medication for 24 hours prior to each session. Participants will be asked to abstain from illicit drugs and tobacco for the duration of participation.

At the end of each session, participants will remain at leisure (with food and entertainment provided) until they attain two consecutive breathalyser recordings of 0.03% or less measured 15 minutes apart. Participants holding their provisional driver

licence, who are intending to drive will be required to remain in the laboratory until two consecutive BrAC measurements are recorded at .00%. Participants holding their provisional licence who are not intending to drive, will be able to leave the laboratory at .03% BrAC if they sign a declaration in which they agree to be escorted by a nominated guardian to their place of residence and accompanied for a two-hour period following session completion. The nominated guardian must be an adult aged 18 years or older who: (i) holds their provisional or full driver licence (ii) directly collects the participant from the research premises and meets the researcher in-person, and (iii) signs a declaration agreeing to escort the participant directly to their place of residence and accompany the participant for the two-hour period following session completion. The researcher reserves the right to retain participants in the laboratory until .03% BrAC for those holding their full driver licence and .00% BrAC for those holding their provisional licence when it is deemed unsafe for the participant to leave at .03% BrAC.

What are the benefits of participating?
Your participation will help us enhance our knowledge of the effects of alcohol on social ability, and specifically, the mechanisms underlying social disinhibition, theory of mind and emotion perception. This knowledge can be used to educate people regarding the potential outcomes of alcohol intoxication on social functioning and will inform further research that aims to investigate alcohol related social difficulties.

What are the risks associated with participating?
There are no anticipated risks of this research. However, if in the unlikely event you experience negative side-effects, please inform the experimenter and the necessary assistance will be sought and provided. We ask that participants refrain from consuming alcohol or operating heavy machinery for four hours post-session.

Is there any reimbursement for participation?
Students of the University of Tasmania who are undertaking KHA111/112 unit will receive three hours of research participation credit for their time. Participants who are not undertaking KHA111/112 units will receive a Village Cinemas movie ticket as recompense for their time. Participants who do not complete the full schedule of sessions will not receive a movie ticket, unless withdrawal is necessary due to an unexpected adverse physiological reaction to the investigatory products.

How do I volunteer to participate? What if I want to withdraw from participating? Participation in this study is voluntary. By signing the attached consent form, you are indicating that you are aware of the nature of the study and wish to participate. While we would be pleased to have you participate, we respect your right to decline. There will be no consequences to you if you decide not to participate. If you decide to discontinue participation at any time, you may do so without providing an explanation. However, you will be required to remain in the laboratory until your breath alcohol concentration measurement equals 0.03% or less on two separate occasions measured 15 minutes apart.

What will happen to the information I provide?
All information collected will be kept confidential. Each participant will be assigned a treatment code and individual participant data will be identifiable only by that code. All

of the data will be stored on password protected secure computers or in a locked cabinet in the Department of Psychology, School of Medicine for a minimum of five years after the publication of any academic journal articles, at which point all questionnaires will be destroyed using a paper shredder and electronic data will be deleted. The screening questionnaire will be securely destroyed immediately on completion of the study and that any information provided by the participant on the questionnaire will be identifiable only by participant number, kept confidential, and viewed only by the experimenter.

Who do I contact if I have any queries?
If you would like to discuss any aspect of this study please contact Sarah Skromanis (sarah.skromanis@utas.edu.au), Stefania Franja (sfranja@utas.edu.au), Carly James (carlyj@utas.edu.au), and Jason Turner (jturner7@utas.edu.au). Alternatively, you can contact Dr Cynthia Honan on (03) 6324 3266 or by email cynthia.honan@utas.edu.au; or Dr Matt Palmer on (03) 6324 3004 or matt.palmer@utas.edu.au.

How do I find out the results of the study?
A summary of the results will be available on the Research webpage of the Discipline of Psychology, University of Tasmania (http://www.utas.edu.au/health/study/psychology). Results of the study can also be provided by contacting the researchers directly.

Who do I contact if I have a complaint about the study?
This study has been approved by the Tasmanian Health and Medical Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study should contact the Executive Officer of the HREC (Tasmania) Network on (03) 6226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. You will need to quote **H0015633**.

Who do I contact if I wish to speak to someone about my alcohol or drug use, or mental health?
As aforementioned, a number of simple screening questionnaires will be administered assessing psychological functioning and alcohol and other drug use. Whilst it is not anticipated that these questionnaires will cause distress, please do not hesitate to let the researcher know if you do not wish to fill them in. If you are concerned about your drinking or mental health, please contact the Tasmanian Alcohol Drug Information Service 1800 811 994 or Lifeline 13 11 14 (both services available 24 hours a day).

Thank you for taking the time to consider this study.
If you wish to take part in it, please sign the attached consent form.
This information sheet is for you to keep.

Appendix F Participant Consent Form

School of Psychology
University of Tasmania

Consent Form

The Impact of Alcohol Consumption on Social Ability

1. I have read and understood the 'Information Sheet' for this project.
2. The nature and possible effects of the study have been explained to me.
3. I understand that because of my prior participation in eligibility screening session in which I have completed measures of psychological distress and alcohol use, as well as reporting my correct demographic data (age, sex, height and weight) that I am eligible to participate in the study.
4. I understand that I will be asked to abstain from food for 4 hours (and consume 2 slices of toast 60 minutes prior to the session), caffeine-containing products for 8 hours, and alcohol and prescription medication for 24 hours prior to each session, and illicit drugs and tobacco for the duration of the study.
5. I will be asked to sign a declaration and complete a breath alcohol concentration measurement (via a breathalyser) to confirm my abstinence at the start of each session.
6. I understand that in the experimental session I may be given a maximum of 6 standard alcoholic drinks, and that I will not be informed of the specific contents of the beverage until the conclusion of testing. I understand that after beverage consumption, I will be asked to complete a number of computerised laboratory behavioural performance tasks during which my behavioural responses will be recorded. I understand that my breath alcohol concentration (as measured via a breathalyser) will be recorded throughout the session, and that I will be asked about my perception of my intoxication and level of impairment.
7. I understand that the study involves attending the Newnham campus of the University of Tasmania (Buildings O and N) for one 100-minute experimental session.
8. I understand that I will be asked to remain in the laboratory until my blood alcohol concentration equals 0.03% or less on two occasions measured 15 minutes apart. This may mean remaining in the laboratory for approximately 3 hours in total.
9. I acknowledge that I have been advised to refrain from drinking alcohol or operating a vehicle or other heavy machinery for four hours after the end of the experimental session.
10. I understand that if I hold a provisional driver licence and I intend to drive I will be required to remain in the laboratory until my breath alcohol concentration is .00% on two consecutive occasions. I understand that if I hold a provisional driver licence and do not intend to drive I will be able to leave the laboratory at .030%

BrAC after signing a declaration in which I agree to be escorted by my nominated legal adult to my place of residence and be accompanied for a two-hour period following session completion. I understand that the nominated legal guardian must be an adult aged 18 years or older who: (i) holds their provisional or full driver licence (ii) directly collects me from the research premises and meets the researcher in-person, and (iii) signs a declaration agreeing to escort me directly to my place of residence and accompany me for a two-hour period following session completion. Furthermore, I understand that the researcher reserves the right to retain participants in the laboratory until .03% BrAC for those holding their full driver licence and .00% BrAC for those holding their provisional licence when it is deemed unsafe for the participant to leave at .03% BrAC. I acknowledge that I have been advised to refrain from drinking alcohol or operating a vehicle or other heavy machinery for four hours after the end of experimental sessions.

11. I understand that if I am a KHA111/112 student will receive three hours of research participation credit. If I am not a KHA111/112 student I understand that I will receive a Village Cinemas Movie ticket for my participation. If I withdraw from the study prior to concluding all sessions I will not be eligible for reimbursement, unless the withdrawal is due to an unexpected adverse event occurring as a consequence of ingesting the beverage.
12. I understand that, while there are no anticipated risks associated with this study, I should inform the experimenter immediately if any unexpected negative side-effects are experienced. I understand the experimenter will immediately cease the session and seek the necessary assistance.
13. I understand that the researchers will maintain my confidentiality and that any information I supply to the researcher(s) will be used only for the purposes of the research. My data will only be identifiable by an individual numerical participant code.
14. I understand that the screening questionnaire will be securely destroyed immediately on completion of the study and that any information I provide on the questionnaire will be identifiable only by my participant number, kept confidential, and viewed only by the experimenter.
15. I understand that all research data will be securely stored on the University of Tasmania premises for at least five years, and will then be securely destroyed when no longer required.
16. I agree that research data gathered from me for the study may be published provided that I cannot be identified as a participant.
17. I agree to participate in this investigation and understand that I may withdraw at any time without any effect, and if I so wish, may request that any data I have supplied to date be withdrawn from the research.
18. Any questions that I have asked have been answered to my satisfaction.

Signature:	Date:

Statement by Investigator

☐ I have explained the project & the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation

If the Investigator has not had an opportunity to talk to participants prior to them participating, the following must be ticked.

☐ The participant has received the Information Sheet where my details have been provided so participants have the opportunity to contact me prior to consenting to participate in this project.

Name of investigator: _____

Signature of investigator: _____ Date: _____

Appendix G TASIT-S Part 2 Social Inference (Minimal) Response Form

Short TASIT: PART 2 ~ SOCIAL INFERENCE (Minimal) - RESPONSE FORM

Name: ……. DOB:..... Date:……..

Instructions:
You will be shown some short scenes on the video. Each one lasts from 15 to 60 seconds. Please watch each scene carefully. After viewing the scene, you will be asked to answer four simple questions. Each time you will be asked:

A. What you think someone is ***doing*** to the other person - i.e., what they are trying to make another person do, think or feel.
B. What you think someone is ***trying to say*** to the other person - i.e., what message they are hoping to get across. Note: this may be different to the actual words they are using. For example, a person may *say*: "It's hot in here" when they are really meaning to say "You should open the window" .
C. What you think someone is ***thinking*** – i.e., what is their underlying belief, which may differ from what they are saying.
D. What you think someone is ***feeling*** – i.e., what emotion they are feeling, or how they feel towards another person or situation.

Each time you only need to answer Yes, No or Don't Know. If you really can't decide whether the answer is "yes" or "no", say "don't know", but try your hardest to choose either "yes" or "no".

PRACTICE ITEM				**Confidence Rating %**
A. Is Ruth trying to pressure Gary into helping her?	Y	N	DK	_____%
B. Is she trying to say it's OK if he doesn't help her?	Y	N	DK	_____%
C. Does she think he should stop what he is doing and help her?	Y	N	DK	_____%
D. Is she annoyed with him?	Y	N	DK	_____%
1. WEEKEND AWAY				
A. Is he seriously suggesting they invite other family members?	Y	N	DK	_____%
B. Is he trying to say he doesn't want her relatives to come?	Y	N	DK	_____%
C. Does she think he wants her relatives to come?	Y	N	DK	_____%
D. Is he annoyed with her?	Y	N	DK	_____%
2. DATE				
A. Is Gary criticising Michael for dating Anne?	Y	N	DK	_____%
B. Is he trying to say it's a mistake to date Anne?	Y	N	DK	_____%
C. Does Gary think Anne is a good date?	Y	N	DK	_____%
D. Is he openly impressed that Michael is dating Anne?	Y	N	DK	_____%
3. LUNCH				
A. Is Ruth reluctantly agreeing to go to the lunch?	Y	N	DK	_____%
B. Is she trying to say she's happy to help out with a salad?	Y	N	DK	_____%
C. Does she think the lunch will be fun?	Y	N	DK	_____%
D. Does she seem pleased about going to the lunch?	Y	N	DK	_____%
4. TIE				
A. Is Ruth encouraging Michael to wear the tie?	Y	N	DK	_____%
B. Is she trying to say the tie is unsuitable for a business meeting?	Y	N	DK	_____%
C. Does she think the tie is suitable for a business meeting?	Y	N	DK	_____%
D. Does she seem to be impressed by his choice?	Y	N	DK	_____%
5. MOVIES				
A. Is Michael agreeing with Ruth about the movie?	Y	N	DK	_____%
B. Is he trying to say he thought the actors were good?	Y	N	DK	_____%
C. Did he think the movie was bad?	Y	N	DK	_____%
D. Is he openly pleased that he saw the movie?	Y	N	DK	_____%
6. TICKETS				
A. Is Michael trying to show he appreciates Gary getting the tickets?	Y	N	DK	_____%
B. Is he trying to say he's pleased about the tickets?	Y	N	DK	_____%
C. *By the end of the scene,* does Gary think Michael wants to go?	Y	N	DK	_____%
D. Is Michael annoyed Gary got him the tickets?	Y	N	DK	_____%

7. PROMOTION

A. Is Ruth sending Michael up about his chances of a promotion?	Y	N	DK	_____%
B. Is she trying to say he's worked really well?	Y	N	DK	_____%
C. Does she think he deserves a promotion?	Y	N	DK	_____%
D. Would she like him to get the promotion?	Y	N	DK	_____%

8. SHIRT

A. Is Ruth reassuring Gary that the shirt is nice?	Y	N	DK	_____%
B. Is she trying to say the shirt is awful?	Y	N	DK	_____%
C. Does she think the shirt's OK?	Y	N	DK	_____%
D. Is she happy for him to wear the shirt?	Y	N	DK	_____%

9. DRESS

A. Is Michael being complimentary about the dress?	Y	N	DK	_____%
B. Is he trying to say the dress looks cheap?	Y	N	DK	_____%
C. Does he like the dress?	Y	N	DK	_____%
D. Does he think Ruth's sister paid a lot for the dress?	Y	N	DK	_____%

Appendix H TASIT-S Part 3 Social Inference (Enriched) Response Form

Short TASIT: PART 3 ~ SOCIAL INFERENCE (Enriched)- RESPONSE FORM

Name: ……. DOB: ..... Date:…….

Instructions:
You will be shown some short scenes on the video. Each one lasts from 15 to 60 seconds. Please watch each scene carefully. After viewing the scene, you will be asked to answer four simple questions. Some of the scenes involve two parts. One of the actors may be talking to different people in each part. You may need to consider the information from both parts in order to answer the questions. Each time you will be asked:

A. What you think someone is ***doing*** to the other person - i.e., what they are trying to make another person do, think or feel.
B. What you think someone is ***trying to say*** to the other person - i.e., what message they are hoping to get across. Note: this may be different to the actual words they are using. For example, a person may *say*: "It's hot in here" when they really mean to say "You should open the window".
C. What you think someone is ***thinking*** – i.e., what is their underlying belief, which may differ from what they say.
D. What you think someoRatne is ***feeling*** – i.e., what emotion they are feeling, or how they feel towards another person or situation.

Each time you only need to answer Yes, No or Don't Know. If you really can't decide whether the answer is "yes" or "no", say "don't know", but try your hardest to choose either "yes" or "no".

PRACTICE ITEM				**Confidence Rating %**
A. Is Ruth trying to pressure Gary into helping her?	Y	N	DK	_____%
B. Is she trying to say it's OK if he doesn't help her?	Y	N	DK	_____%
C. Does she think he should stop what he is doing and help her?	Y	N	DK	_____%
D. Is she annoyed with him?	Y	N	DK	_____%
1. ICE CREAM				
A. Is Tanya trying to hide the fact that Cal didn't eat all his dinner?	Y	N	DK	_____%
B. Is she trying to say Cal obeyed Mick?	Y	N	DK	_____%
C. Does Mick think Cal has eaten all his dinner?	Y	N	DK	_____%
D. Is Tanya openly annoyed?	Y	N	DK	_____%
2. SCRIBBLING				
A. Is Gary hiding the fact that Rosie scribbled in his book?	Y	N	DK	_____%
A. Is he trying to say Rosie needs another lesson in how to treat books?	Y	N	DK	_____%
C. Does Ruth know that Rosie scribbled in the book?	Y	N	DK	_____%
D. Is Gary openly annoyed about the scribbles in the book?	Y	N	DK	_____%
3. MOVING				
A. Is Rowan trying to make Tanya believe he's happy to help her?	Y	N	DK	_____%
B. Is he trying to tell her his back hurts?	Y	N	DK	_____%
C. Does he think he should continue carrying boxes?	Y	N	DK	_____%
D. Is he openly showing concern for Tanya's feelings?	Y	N	DK	_____%
4. PARTY				
A. Is Tanya genuinely trying to make Kath feel better about her party?	Y	N	DK	_____%
B. Is she trying to say it wasn't Kath's fault?	Y	N	DK	_____%
C. Does Tanya think the party was a success?	Y	N	DK	_____%
D. Is Tanya openly sympathetic and caring towards Kath?	Y	N	DK	_____%
5. OUTFIT				
A. Is Ruth teasing Keith about how the outfit looks?	Y	N	DK	_____%
B. Is she trying to say it isn't so bad?	Y	N	DK	_____%
C. Does she think it looks awful?	Y	N	DK	_____%
D. Is she openly sympathetic?	Y	N	DK	_____%

6. CROSSWORD

A. Is Mick trying to make Keith believe he's completed the crossword?	Y	N	DK	_____%
B. Is he trying to say he found it easy?	Y	N	DK	_____%
C. *By end of scene*, does Keith think Mick did well on the crossword?	Y	N	DK	_____%
D. Is Mick openly annoyed at Keith?	Y	N	DK	_____%

7. ENOUGH TO EAT

A. Is Gary joking with Angela about having enough to eat?	Y	N	DK	_____%
B. Is he trying to say he's still hungry?	Y	N	DK	_____%
C. Does she think he's joking with her?	Y	N	DK	_____%
D. Is he openly showing concern for her feelings?	Y	N	DK	_____%

8. FAT *When Ruth is talking to Gary in the fitting room:*

A. Is she trying to make him believe he hasn't put on weight?	Y	N	DK	_____%
B. Is she trying to say he has put on weight?	Y	N	DK	_____%
C. Does she think he's put on weight?	Y	N	DK	_____%
D. Does he seem happy with her?	Y	N	DK	_____%

9. HOT WATER BOTTLE

A. Is Mick trying to make Olivia believe he'll pack the hot-water bottle?	Y	N	DK	_____%
B. Is he trying to say it's a silly idea to take the hot-water bottle?	Y	N	DK	_____%
C. Does he believe it's a good idea to take the hot-water bottle?	Y	N	DK	_____%
D. Is he openly playing with her?	Y	N	DK	_____%

Appendix I Widmark Equation

Widmark Equation

Dose of Alcohol (mg) = $W\rho (C_1 + \beta t)$

W Body weight of Participant (kg).

ρ Alcohol distribution in the body

C_1 Expected breath alcohol concentration (BrAC; g/100mL)

β Alcohol elimination rate. Determined to be 0.015g/100mL/hour.

Note: A division of 0.8 is calculated to achieve a final alcohol dose (mg).

Appendix J TASIT-S Performance (between- & within-subjects)

TASIT-S Performance *Condition x Subtest* Pairwise Comparisons

	Alcohol	Placebo	*F* Sig *d*
	M (*SD*)	*M* (*SD*)	
Part 2 Sincere - Minimal	69.47 (15.40)	75.59 (17.12)	$F(1, 161.05) = 3.31$, $p = .071$, $d = 0.39$.
Part 2 Sarcasm - Minimal	86.15 (15.40)	83.57 (17.12)	$F(1, 161.05) = 0.59$, $p = .444$, $d = 0.16$.
Part 3 Lies - Enriched	70.91 (15.40)	75.89 (17.12)	$F(1, 161.05) = 2.19$, $p = .141$, $d = 0.35$.
Part 3 Sarcasm - Enriched	83.65 (15.40)	85.95 (17.12)	$F(1, 161.05) = 0.47$, $p = .495$, $d = 0.14$.

TASIT-S Performance *Condition x Item Type* Pairwise Comparisons

Item Type	Alcohol *M* (*SD*)	Placebo *M* (*SD*)	*F* Sig *d*
Do	80.38 (11.45)	83.10 (11.45)	$F(1, 161.05) = 0.65$, $p = .422$, $d = 0.24$.
Say	78.51 (11.45)	81.43 (11.45)	$F(1, 161.05) = 0.75$, $p = .387$, $d = 0.25$.
Think	79.37 (11.45)	78.33 (11.45)	$F(1, 161.05) = 0.10$, $p = .757$, $d = 0.09$.
Feel	71.92 (11.45)	78.15 (11.45)	$F(1, 161.05) = 3.43$, $p = .066$, $d = 0.54$.

TASIT-S Performance *Condition x Item Type x Subtest* Pairwise Comparisons

Item Type	Subtest	Alcohol M (SD)	Placebo M (SD)	*p*	*d*
Do	Sincere Pt 2 Minimal	70.20 (19.48)	75.00 (19.50)	$F(1, 605.15) = .71$, $p = .401$,	$d = 0.24$.
	Sarcasm Pt 2 Minimal	84.62 (19.48)	86.67 (19.50)	$F(1, 605.15) = .13$, $p = .720$,	$d = 0.11$.
	Lies Pt 3 Enriched	87.50 (19.48)	86.91 (19.50)	$F(1, 605.15) = .01$, $p = .917$,	$d = 0.06$.
	Sarcasm Pt 3 Enriched	79.23 (19.48)	83.81 (19.50)	$F(1, 605.15) = .64$, $p = .424$,	$d = 0.24$.
Say	Sincere Pt 2 Minimal	79.81 (19.48)	84.13 (19.50)	$F(1, 605.15) = .17$, $p = .683$,	$d = 0.22$.
	Sarcasm Pt 2 Minimal	83.08 (19.48)	81.90 (19.50)	$F(1, 605.15) = .04$, $p = .838$,	$d = 0.06$.
	Lies Pt 3 Enriched	71.15 (19.48)	75.00 (19.50)	$F(1, 605.15) = .45$, $p = .502$,	$d = 0.20$.
	Sarcasm Pt 3 Enriched	80.00 (19.48)	86.67 (19.50)	$F(1, 605.15) = 1.36$, $p = .245$,	$d = 0.34$.
Think	Sincere Pt 2 Minimal	62.50 (19.48)	65.78 (19.50)	$F(1, 605.15) = .27$, $p = .603$,	$d = 0.17$.
	Sarcasm Pt 2 Minimal	86.15 (19.48)	83.81 (19.50)	$F(1, 605.15) = .17$, $p = .682$,	$d = 0.12$.
	Lies Pt 3 Enriched	71.15 (19.48)	67.86 (19.50)	$F(1, 605.15) = .33$, $p = .565$,	$d = 0.17$.
	Sarcasm Pt 3 Enriched	97.69 (19.48)	96.19 (19.50)	$F(1, 605.15) = .07$, $p = .793$,	$d = 0.08$.
Feel	**Sincere Pt 2 Minimal**	**65.39 (19.48)**	**79.76 (19.50)**	$\mathbf{F(1, 605.15) = 6.31, p = .012, d = 0.74.}$	
	Sarcasm Pt 2 Minimal	90.77 (19.48)	81.90 (19.50)	$F(1, 605.15) = 2.40$, $p = .122$,	$d = 0.46$.
	Lies Pt 3 Enriched	**53.85 (19.48)**	**73.81 (19.50)**	$\mathbf{F(1, 605.15) = 12.16, p = .001, d = 1.02.}$	
	Sarcasm Pt 3 Enriched	77.69 (19.48)	77.14 (19.50)	$F(1, 605.15) = 0.01$, $p = .924$,	$d = 0.03$

Within-Subjects: *TASIT-S* Performance *Condition x Subtest* Pairwise Comparisons

Condition	Subtest *M* (*SD*)	Subtest *M* (*SD)*	*F* Sig *d*
Alcohol	Sincere/Minimal	Lies/Enriched	
	69.47 (11.45)	70.91 (11.45)	$F(3, 705) = 23.01$, $p = .568$, $d = 0.13$.
	Sarcasm/Minimal	Sarcasm/Enriched	
	86.15 (11.45)	83.65 (.11.45)	$F(3, 705) = 23.01$, $p = .323$, $d = 0.22$.
Placebo	Sincere/Minimal	Lies/Enriched	
	75.60 (11.46)	75.89 (11.46)	$F(3, 705) = 7.10$, $p = .916$, $d = 0.03$.
	Sarcasm/Minimal	Sarcasm/Enriched	
	83.57 (11.46)	85.95 (11.46)	$F(3, 705) = 7.10$, $p = .398$, $d = 0.21$.

Within-Subjects: *TASIT-S* Performance *Condition x Item Type* Pairwise Comparisons

Condition	Item Type *M* (*SD*)	Item Type *M* (*SD)*	*p*	*d*
Alcohol	Do	Say		
	80.38 (11.45)	78.15 (11.45)	.459	0.19
	Do	Think		
	80.38 (11.45)	79.38 (11.45)	.690	0.19
	Do	**Feel**		
	80.38 (11.45)	**71.92 (11.45)**	**.001**	**0.74**
	Say	Think		
	78.51 (11.45)	79.38 (11.45)	.732	0.08
	Say	**Feel**		
	78.51 (11.45)	**71.92 (11.45)**	**.009**	**0.58**
	Think	**Feel**		
	79.38 (11.45)	**71.92 (11.45)**	**.003**	**0.65**
Placebo	Do	Say		
	83.06 (11.46)	81.43 (11.46)	.554	0.14
	Do	Think		
	83.06	78.33	.091	0.41

(11.46)	(11.46)		
Do	Feel		
83.06	78.16	.079	0.43
(11.46)	(11.46)		
Say	Think		
81.43	78.33	.272	0.41
(11.46)	(11.46)		
Say	Feel		
81.43	78.16	.245	0.28
(11.46)	(11.46)		
Think	Feel		
78.33	78.16	.949	0.02
(11.46)	(11.46)		

Within-Subjects: *TASIT-S* Performance *Condition x Item Type x Subtest* Pairwise Comparisons

Condition	Item Type	Subtest M (SD)	Subtest M (SD)	*p*	*d*
Alcohol	**Do**	**Sincere**	**Lies**		
		70.19 (25.76)	**87.50 (25.76)**	**.001**	**0.67**
		Sarcasm Pt 2	Sarcasm Pt 3		
		84.62 (25.76)	79.23 (25.76)	.287	0.21
	Say	Sincere	Lies		
		79.81 (25.76)	71.15 (25.76)	.087	0.30
		Sarcasm Pt 2	Sarcasm Pt 3		
		83.08 (25.76)	80.00 (25.76)	.543	0.12
	Think	Sincere	Lies		
		62.50 (25.76)	71.15 (25.76)	.087	0.34
		Sarcasm Pt 2	Sarcasm Pt 3		
		86.15 (25.76)	97.69 (25.76)	***.023***	0.45
	Feel	Sincere	Lies		
		65.39 (25.76)	53.85 (25.76)	***.023***	0.45
		Sarcasm Pt 2	**Sarcasm Pt 3**		
		90.77 (25.76)	**77.69 (25.76)**	**.010**	**0.51**

Placebo	**Do**	**Sincere**	**Lies**		
		75.00 (25.79)	**86.90 (25.79)**	**.001**	**0.46**
		Sarcasm Pt 2	Sarcasm Pt 3		
		86.67 (25.79)	83.81 (25.79)	.287	0.11
	Say	Sincere	Lies		
		82.14 (25.79)	75.00 (25.79)	.087	0.28
		Sarcasm Pt 2	Sarcasm Pt 3		
		81.90 (25.79)	86.67 (25.79)	.543	0.19
	Think	Sincere	Lies		
		65.48 (25.79)	67.86 (25.79)	.087	0.09
		Sarcasm Pt 2	***Sarcasm Pt 3***		
		83.81 (25.79)	***96.19 (25.79)***	***.023***	***0.48***
	Feel	***Sincere***	***Lies***		
		79.76 (25.79)	***73.81 (25.79)***	***.023***	***0.23***
		Sarcasm Pt 2	**Sarcasm Pt 3**		
		81.91 (25.79)	**77.14 (25.79)**	**.010**	**0.18**

Appendix K Calibration Statistic (between- & within-subjects)

Calibration Statistic - Condition x Subtest **Pairwise Comparisons**

	Alcohol *M* (*SD*)	Placebo *M* (*SD*)	*F* Sig *d*
Part 2 Sincere - Minimal	**.179 (.06)**	**.125 (.06)**	***F*(1, 206.43) = 9.62, *p* = .002, *d* = 0.90.**
Part 2 Sarcasm - Minimal	.079 (.06)	.088 (.06)	*F*(1, 206.43) = 0.27, *p* = .606, *d* = 0.15.
Part 3 Lies - Enriched	***.171 (.06)***	***.126 (.06)***	***F(1, 206.43) = 6.65, p = .011, d = 0.75.***
Part 3 Sarcasm - Enriched	.082 (.06)	.071 (.06)	*F*(1, 206.43) = 0.45, *p* = .505, *d* = 0.18.

Calibration Statistic - Condition x Item Type **Pairwise Comparisons**

Item Type	Alcohol *M* (*SD*)	Placebo *M* (*SD*)	*F* Sig *d*
Do	.119 (.06)	.101 (.06)	*F*(1, 206.43) = 1.07, *p* = .303, *d* = 0.30.
Say	.104 (.06)	.100 (.06)	*F*(1, 206.43) = 0.04, *p* = .838, *d* = 0.07.
Think	.166 (.06)	.129 (.06)	*F*(1, 206.43) = 4.80, *p* = .030, *d* = 0.62.
Feel	***.122 (.06)***	***.080 (.06)***	***F(1, 206.43) = 5.77, p = .017, d = 0.70.***

Calibration Statistic - Condition x Item Type x Subtest **Pairwise Comparisons**

Item Type	Subtest	Alcohol M (SD)	Placebo M (SD)	*F*	*p*	*d*
Do	Sincere Pt 2	.162	.155	*F*(1, 676.13) = .07,	*p* = .797,	*d* = 0.06.
	Minimal	(.11)	(.11)			
	Sarcasm Pt 2	.079	.053	*F*(1, 676.13) = .69,	*p* = .407,	*d* = 0.24.
	Minimal	(.11)	(.11)			
	Lies Pt 3	.135	.124	*F*(1, 676.13) = .11,	*p* = .736,	*d* = 0.10.
	Enriched	(.11)	(.11)			
	Sarcasm Pt 3	.101	.074	*F*(1, 676.13) = .80,	*p* = .371,	*d* = 0.25.
	Enriched	(.11)	(.11)			
Say	Sincere Pt 2	.130	.093	*F*(1, 676.13) = 1.42,	*p* = .233,	*d* = 0.33.
	Minimal	(.11)	(.11)			
	Sarcasm Pt 2	.103	.119	*F*(1, 676.13) = .26,	*p* = .610,	*d* = 0.15.
	Minimal	(.11)	(.11)			
	Lies Pt 3	.149	.156	*F*(1, 676.13) = .05,	*p* = .819,	*d* = 0.06.
	Enriched	(.11)	(.11)			
	Sarcasm Pt 3	.033	.033	*F*(1, 676.13) = .00,	*p* = .997,	*d* = 0.01.
	Enriched	(.11)	(.11)			
Think	Sincere Pt 2	.210	.160	*F*(1, 676.13) = 2.63,	*p* = .106,	*d* = 0.46.
	Minimal	(.11)	(.11)			
	Sarcasm Pt 2	.070	.093	*F*(1, 676.13) = .57,	*p* = .451,	*d* = 0.21.
	Minimal	(.11)	(.11)			
	Lies Pt 3 Enriched	**.266 (.11)**	**.159 (.11)**	***F*(1, 676.13) = 12.10,**	***p* = .001,**	***d* = 0.97.**
	Sarcasm Pt 3	.120	.102	*F*(1, 676.13) = .33,	*p* = .565,	*d* = 0.16.
	Enriched	(.11)	(.11)			
Feel	**Sincere Pt 2 Minimal**	**.213 (.11)**	**.093 (.11)**	***F*(1, 676.13) = 15.13,**	***p* = < .001,**	***d* = 1.10.**
	Sarcasm Pt 2	.065	.088	*F*(1, 676.13) = .53,	*p* = .469,	*d* = 0.21.
	Minimal	(.11)	(.11)			
	Lies Pt 3 Enriched	***.134 (.11)***	***.066 (.11)***	***F(1, 676.13) = 4.84,***	***p = .028,***	***d = 0.62.***
	Sarcasm Pt 3	.075	.074	*F*(1, 676.13) = .01,	*p* = .979,	*d* = 0.01.
	Enriched	(.11)	(.11)			

Within-Subjects: *Calibration - Condition x Subtest* Interaction Pairwise Comparisons

Condition	Subtest *M* (*SD*)	Subtest *M* (*SD*)	*F* Sig *d*
Alcohol	Sincere/Minimal	Lies/Enriched	
	.179 (.06)	.171 (.06)	$F(1, 705) = 30.67$, $p = .573$, $d = 0.13$.
	Sarcasm/Minimal	Sarcasm/Enriched	
	.079 (.06)	.082 (.06)	$F(1, 705) = 30.67$, $p = .837$, $d = 0.05$.
Placebo	Sincere/Minimal	Lies/Enriched	
	.125 (.06)	.126 (.06)	$F(1, 705) = 6.43$, $p = .939$, $d = 0.02$.
	Sarcasm/Minimal	Sarcasm/Enriched	
	.088 (.06)	.071 (.06)	$F(1, 705) = 6.43$, $p = .256$, $d = 0.28$.

Within-Subjects: *Calibration Statistic - Condition x Item Type* Pairwise Comparisons

Condition	Item Type *M* (*SD*)	Item Type *M* (*SD*)	*p*	*d*
Alcohol	Do	Say		
	.119	.104	.266	0.25
	(.06)	(.06)		
	Do	**Think**		
	.119	**.166**	**.001**	**0.78**
	(.06)	**(.06)**		
	Do	Feel		
	.119	.122	.861	0.05
	(.06)	(.06)		
	Say	**Think**		
	.104	**.166**	**< .001**	**1.03**
	(.06)	**(.06)**		
	Say	Feel		
	.104	.122	.198	0.30
	(.06)	(.06)		
	Think	**Feel**		
	.166	**.122**	**.001**	**0.73**
	(.06)	**(.06)**		

Placebo	Do	Say		
	.101	.100	.940	0.02
	(.06)	(.06)		
	Do	Think		
	.101	.129	.081	0.47
	(.06)	(.06)		
	Do	Feel		
	.101	.080	.171	0.35
	(.06)	(.06)		
	Say	Think		
	.100	.129	.069	0.48
	(.06)	(.06)		
	Say	Feel		
	.100	.080	.195	0.33
	(.06)	(.06)		
	Think	**Feel**		
	.129	**.080**	**.002**	**0.82**
	(.06)	**(.06)**		

Within-Subjects: *Calibration - Condition x Item Type x Subtest* Interaction Pairwise Comparisons

Condition	Item Type	Subtest M (SD)	Subtest M (SD)	*p*	*d*
Alcohol	Do	Sincere	Lies		
		.162 (0.11)	.135 (0.11)	.322	0.24
		Sarcasm Pt 2	Sarcasm Pt 3		
		.079 (0.11)	.101 (0.11)	.414	0.20
	Say	Sincere	Lies		
		.130 (0.11)	.149 (0.11)	.495	0.17
		Sarcasm Pt 2	**Sarcasm Pt 3**		
		.103 (0.11)	**.033 (0.11)**	**.012**	**0.67**
	Think	Sincere	Lies		
		.210 (0.11)	.266 (0.11)	.044	0.51
		Sarcasm Pt 2	Sarcasm Pt 3		
		.070 0.11)	.120 (0.11)	.074	0.46
	Feel	**Sincere**	**Lies**		
		.213 (0.11)	**.134 (0.11)**	**.005**	**0.72**
		Sarcasm Pt 2	Sarcasm Pt 3		
		.065 (0.11)	.075 (0.11)	.740	0.09

Placebo	Do	Sincere	Lies		
		.155 (0.11)	.124 (0.11)	.322	0.28
		Sarcasm Pt 2	Sarcasm Pt 3		
		.053 (0.11)	.074 (0.11)	.503	0.28
	Say	Sincere	Lies		
		.093 (0.11)	.156 (0.11)	.043	0.57
		Sarcasm Pt 2	**Sarcasm Pt 3**		
		.119 (0.11)	**.033 (0.11)**	**.006**	**0.78**
	Think	Sincere	Lies		
		.160 (0.11)	.159 (0.11)	.971	0.01
		Sarcasm Pt 2	Sarcasm Pt 3		
		.093 (0.11)	.102 (0.11)	.773	0.08
	Feel	Sincere	Lies		
		.093 (0.11)	.066 (0.11)	.386	0.25
		Sarcasm Pt 2	Sarcasm Pt 3		
		.088 (0.11)	.074 (0.11)	.654	0.13

Appendix L Over/Under Statistic (between- & within-subjects)

Over/Under Statistic - Condition x Subtest **Pairwise Comparisons**

	Alcohol *M* (*SD*)	Placebo *M* (*SD*)	*F* Sig *d*
Part 2 Sincere - Minimal	.053 (.14)	.008 (.14)	$F(1, 95.57) = 1.11$, $p = .295$, $d = 0.32$.
Part 2 Sarcasm - Minimal	-.038 (.14)	.001 (.14)	$F(1, 95.57) = .84$, $p = .361$, $d = 0.28$.
Part 3 Lies - Enriched	.103 (.14)	.079 (.14)	$F(1, 95.57) = .31$, $p = .581$, $d = 0.17$.
Part 3 Sarcasm - Enriched	.017 (.14)	.021 (.14)	$F(1, 95.57) = .01$, $p = .922$, $d = 0.03$.

Over/Under Statistic - Condition x Item Type **Pairwise Comparisons**

Item Type	Alcohol *M* (*SD*)	Placebo *M* (*SD*)	*F* Sig *d*
Do	.020 (.14)	.019 (.14)	$F(1, 95.57) = .01$, $p = .978$, $d = 0.01$.
Say	.022 (.14)	.023 (.14)	$F(1, 95.57) = .01$, $p = .967$, $d = 0.01$.
Think	.023 (.14)	.044 (.14)	$F(1, 95.57) = .24$, $p = .625$, $d = 0.15$.
Feel	.070 (.14)	.023 (.14)	$F(1, 95.57) = 1.2$, $p = .277$, $d = 0.34$.

***Over/Under Statistic* - *Condition x Item Type x Subtest* Pairwise Comparisons**

Item Type	Subtest	Alcohol M (SD)	Placebo M (SD)	*F*	*p*	*d*
Do	Sincere Pt 2	.073	.023	*F*(1, 360.17) = .64,	*p* = .423,	*d* = 2.50.
	Minimal	(.02)	(.02)			
	Sarcasm Pt 2	-.025	-.014	*F*(1, 360.17) = .03,	*p* = .870,	*d* = 0.55.
	Minimal	(.02)	(.02)			
	Lies Pt 3	-.031	.020	*F*(1, 360.17) = .66,	*p* = .418,	*d* = 2.55.
	Enriched	(.02)	(.02)			
	Sarcasm Pt 3	.063	.048	*F*(1, 360.17) = .06	*p* = .806,	*d* = 0.75.
	Enriched	(.02)	(.02)			
Say	Sincere Pt 2	-.043	-.043	*F*(1, 360.17) = .00,	*p* = .995,	*d* = 0.01.
	Minimal	(.02)	(.02)			
	Sarcasm Pt 2	-.019	.010	*F*(1, 360.17) = .22,	*p* = .637,	*d* = 1.45.
	Minimal	(.02)	(.02)			
	Lies Pt 3	.122	.115	*F*(1, 360.17) = .01,	*p* = .916,	*d* = 0.35.
	Enriched	(.02)	(.02)			
	Sarcasm Pt 3	.027	.010	*F*(1, 360.17) = .07,	*p* = .794,	*d* = 0.85.
	Enriched	(.02)	(.02)			
Think	Sincere Pt 2	.112	.087	*F*(1, 360.17) = .15,	*p* = .696,	*d* = 1.25.
	Minimal	(.02)	(.02)			
	Sarcasm Pt 2	-.033	-.001	*F*(1, 360.17) = .26,	*p* = .610,	*d* = 1.60.
	Minimal	(.02)	(.02)			
	Lies Pt 3	.099	.150	*F*(1, 360.17) = .66,	*p* = .419,	*d* = 2.55.
	Enriched	(.02)	(.02)			
	Sarcasm Pt 3	-.085	-.061	*F*(1, 360.17) = .15,	*p* = .698,	*d* = 1.20.
	Enriched	(.02)	(.02)			
Feel	Sincere Pt 2	.070	-.033	*F*(1, 360.17) = 2.70,	*p* = .101,	*d* = 5.15.
	Minimal	(.02)	(.02)			
	Sarcasm Pt 2	-.075	.009	*F*(1, 360.17) = 1.75,	*p* = .187,	*d* = .20.
	Minimal	(.02)	(.02)			
	Lies Pt 3	**.211**	**.032**	***F*(1, 360.17) = 9.02,**	***p* = .003,**	***d* = 8.95.**
	Enriched	**(.02)**	**(.02)**			
	Sarcasm Pt 3	.062	.086	*F*(1, 360.17) = .15,	*p* = .701,	*d* = 1.20.
	Enriched	(.02)	(.02)			

Within-Subjects: *Over/Under Statistic - Condition x Subtest* Interaction Pairwise Comparisons

Condition	Subtest *M* (*SD*)	Subtest *M* (*SD)*	*F* Sig *d*
Alcohol	**Sincere/Minimal**	**Lies/Enriched**	
	.053 (.14)	**.103 (.14)**	***F*(1, 705) = 10.90, *p* = < .001, *d* = 0.36.**
	Sarcasm/Minimal	**Sarcasm/Enriched**	
	-.038 (.14)	**.017 (.14)**	***F*(1, 705) = 10.90, *p* = < .001, *d* = 0.39.**
Placebo	Sincere/Minimal	Lies/Enriched	
	.008 (.14)	.079 (.14)	*F*(1, 705) = 3.18, *p* = .023, *d* = 0.51.
	Sarcasm/Minimal	Sarcasm/Enriched	
	.001 (.14)	.021 (.14)	*F*(1, 705) = 3.18, *p* = .023, *d* = 0.14.

Within-Subjects: *Over/Under Statistic - Condition x Item Type* Pairwise Comparisons

Condition	Item Type *M* (*SD*)	Item Type *M* (*SD)*	*p*	*d*
Alcohol	Do	Say		
	.020 (.14)	.022 (.14)	.955	0.01
	Do	Think		
	.020 (.14)	.023 (.14)	.911	0.02
	Do	Feel		
	.020 (.14)	.070 (.14)	.053	0.36
	Say	Think		
	.022 (.14)	.023 (.14)	.956	0.01
	Say	Feel		
	.022 (.14)	.070 (.14)	.060	0.34
	Think	Feel		
	.023 (.14)	.070 (.14)	.068	0.34

Placebo	Do	Say		
	.019	.023	.878	0.03
	(.14)	(.14)		
	Do	Think		
	.019	.044	.383	0.18
	(.14)	(.14)		
	Do	Feel		
	.019	.023	.881	0.03
	(.14)	(.14)		
	Say	Think		
	.023	.044	.472	0.15
	(.14)	(.14)		
	Say	Feel		
	.100	.023	.997	0.55
	(.14)	(.14)		
	Think	Feel		
	.044	.023	.469	0.15
	(.14)	(.14)		

Within-Subjects: *Over/Under Statistic - Condition x Item Type x Subtest* Interaction Pairwise Comparisons

Condition	Item Type	Subtest M (SD)	Subtest M (SD)	*p*	*d*
Alcohol	Do	Sincere	Lies		
		.073 (0.2)	-.031 (0.2)	.055	0.52
		Sarcasm Pt 2	Sarcasm Pt 3		
		-.025 (0.2)	.063 (0.2)	.085	0.44
	Say	**Sincere**	**Lies**		
		-.043 (0.2)	**-.019 (0.2)**	**.001**	**0.12**
		Sarcasm Pt 2	Sarcasm Pt 3		
		.122 (0.2)	.027 (0.2)	.364	0.48
	Think	Sincere	Lies		
		.112 (0.2)	.099 (0.2)	.806	0.07
		Sarcasm Pt 2	Sarcasm Pt 3		
		-.033 (0.2)	-.085 (0.2)	.304	0.26
	Feel	**Sincere**	**Lies**		
		.070 (0.2)	**.221 (0.2)**	**.003**	**0.75**
		Sarcasm Pt 2	**Sarcasm Pt 3**		
		-.075 (0.2)	**.062 (0.2)**	**.008**	**0.69**

Placebo	Do	Sincere	Lies		
		.023 (0.2)	.020 (0.2)	.966	0.02
		Sarcasm Pt 2	Sarcasm Pt 3		
		-.014 (0.2)	.048 (0.2)	.274	0.31
	Say	**Sincere**	**Lies**		
		-.043 (0.2)	**.115 (0.2)**	**.005**	**0.79**
		Sarcasm Pt 2	Sarcasm Pt 3		
		.010 (0.2)	.010 (0.2)	1.00	0.01
	Think	Sincere	Lies		
		.087 (0.2)	.150 (0.2)	.265	0.32
		Sarcasm Pt 2	Sarcasm Pt 3		
		-.001 (0.2)	-.061 (0.2)	.289	0.30
	Feel	Sincere	Lies		
		-.033 (0.2)	.032 (0.2)	.248	0.32
		Sarcasm Pt 2	Sarcasm Pt 3		
		.009 (0.2)	.086 (0.2)	.173	0.39

Appendix M ANDI Statistic (between- & within-subjects)

ANDI Statistic - Condition x Subtest **Pairwise Comparisons**

	Alcohol *M* (*SD*)	Placebo *M* (*SD*)	*F* Sig *d*
Part 2 Sincere - Minimal	.427 (.03)	.547 (.03)	$F(1, 154.17) = 1.91$, $p = .169$, $d = 4.00$.
Part 2 Sarcasm - Minimal	.482 (.03)	.499 (.03)	$F(1, 212.16) = .03$, $p = .864$, $d = 0.57$.
Part 3 Lies - Enriched	.231 (.01)	.261 (.03)	$F(1, 141.20) = .51$, $p = .479$, $d = 1.41$.
Part 3 Sarcasm - Enriched	.380 (.04)	.383 (.04)	$F(1, 95.57) = .01$, $p = .978$, $d = 0.08$.

ANDI Statistic - Condition x Item Type **Pairwise Comparisons**

Item Type	Alcohol *M* (*SD*)	Placebo *M* (*SD*)	*F* Sig *d*
Do	.344 (.03)	.276 (.03)	$F(1, 154.17) = 1.91$, $p = .169$, $d = 2.27$.
Say	.390 (.03)	.448 (.03)	$F(1, 212.16) = .03$, $p = .864$, $d = 1.93$.
Think	.453 (.04)	.549 (.04)	$F(1, 141.20) = .51$, $p = .479$, $d = 2.40$
Feel	.421 (.03)	.417 (.03)	$F(1, 308.33) = .01$, $p = .978$, $d = 0.13$.

***ANDI Statistic - Condition x Item Type x Subtest* Pairwise Comparisons**

Item Type	Subtest	Alcohol M (SD)	Placebo M (SD)	*F*	*p*	*d*
Do	Sincere Pt 2	.469	.517	$F(1, 437.97) = .11$,	$p = .745$,	$d = 0.96$.
	Minimal	(.05)	(.05)			
	Sarcasm Pt 2	.531	.441	$F(1, 464.05) = .28$,	$p = .600$,	$d = 1.51$.
	Minimal	(.05)	(.07)			
	Lies Pt 3	.079	.043	$F(1, 393.54) = .08$,	$p = .777$,	$d = 0.60$.
	Enriched	(.04)	(.05)			
	Sarcasm Pt 3	.298	.102	$F(1, 455.78) = 1.45$	$p = .230$,	$d = 3.51$.
	Enriched	(.06)	(.05)			
Say	Sincere Pt 2	.436	.548	$F(1, 457.25) = .47$,	$p = .496$,	$d = 2.05$.
	Minimal	(.05)	(.06)			
	Sarcasm Pt 2	.452	.562	$F(1, 463.67) = .41$,	$p = .525$,	$d = 1.83$.
	Minimal	(.06)	(.06)			
	Lies Pt 3	.419	.286	$F(1, 451.88) = .70$,	$p = .405$,	$d = 2.43$.
	Enriched	(.05)	(.06)			
	Sarcasm Pt 3	.255	.397	$F(1, 465.31) = .66$,	$p = .417$,	$d = 2.20$.
	Enriched	(.06)	(.07)			
Think	Sincere Pt 2	.455	.670	$F(1, 421.84) = 2.35$,	$p = .126$,	$d = 4.30$.
	Minimal	(.05)	(.05)			
	Sarcasm Pt 2	.411	.444	$F(1, 465.09) = .04$,	$p = .851$,	$d = 0.55$.
	Minimal	(.06)	(.06)			
	Lies Pt 3	.360	.392	$F(1, 417.36) = .06$,	$p = .815$,	$d = 0.64$.
	Enriched	(.05)	(.05)			
	Sarcasm Pt 3	.587	.688	$F(1, 470.85) = .10$,	$p = .753$,	$d = 0.11$.
	Enriched	(1.23)	(.09)			
Feel	Sincere Pt 2	.346	.454	$F(1, 441.25) = .52$,	$p = .473$,	$d = 2.16$.
	Minimal	(.05)	(.05)			
	Sarcasm Pt 2	.534	.550	$F(1, 469.28) = .01$,	$p = .931$,	$d = 0.24$.
	Minimal	(.07)	(.06)			
	Lies Pt 3	.424	.321	$F(1, 445.79) = .45$,	$p = .502$,	$d = 1.88$.
	Enriched	(.05)	(.06)			
	Sarcasm Pt 3	.378	.345	$F(1, 438.22) = .05$,	$p = .820$,	$d = 0.66$.
	Enriched	(.05)	(.05)			

Within-Subjects: *ANDI Statistic - Condition x Subtest* Interaction Pairwise Comparisons

Condition	Subtest *M* (*SD*)	Subtest *M* (*SD*)	*F* Sig *d*
Alcohol	Sincere/Minimal	Lies/Enriched	
	.427 (.03)	.321 (.03)	$F(1, 446.22) = 1.88$, $p = .109$, $d = 3.53$.
	Sarcasm/Minimal	Sarcasm/Enriched	
	.482 (.03)	.380 (.04)	$F(1, 445.08) = 1.88$, $p = .274$, $d = 2.88$.
Placebo	**Sincere/Minimal**	**Lies/Enriched**	
	.547 (.03)	**.261 (.04)**	$\mathbf{F(1, 446.11) = 5.67, p = .001, d = 8.09.}$
	Sarcasm/Minimal	Sarcasm/Enriched	
	.499 (.03)	.383 (.04)	$F(1, 450.89) = 5.67$, $p = .226$, $d = 3.28$.

Within-Subjects: *ANDI Statistic - Condition x Item Type* Pairwise Comparisons

Condition	Item Type *M* (*SD*)	Item Type *M* (*SD*)	*p*	*d*
Alcohol	Do	Say		
	.344 (.03)	.390 (.03)	.514	1.53
	Do	Think		
	.344 (.03)	.453 (.03)	.211	3.63
	Do	Feel		
	.344 (.03)	.421 (.03)	.286	2.57
	Say	Think		
	.390 (.03)	.453 (.04)	.479	1.78
	Say	Feel		
	.390 (.03)	.421 (.03)	.680	1.03
	Think	Feel		
	.453 (.04)	.421 (.03)	.715	0.91

Placebo	Do	Say		
	.276	.448	.035	4.86
	(.03)	(.04)		
	Do	**Think**		
	.276	**.549**	**.002**	**7.27**
	(.03)	**(.04)**		
	Do	Feel		
	.276	.417	.066	4.70
	(.03)	(.03)		
	Say	Think		
	.448	.549	.277	2.53
	(.04)	(.04)		
	Say	Feel		
	.448	.417	.706	0.88
	(.04)	(.03)		
	Think	Feel		
	.549	.417	.137	3.73
	(.04)	(.03)		

Within-Subjects: *ANDI Statistic - Condition x Item Type x Subtest* Interaction Pairwise Comparisons

Condition	Item Type	Subtest M (SD)	Subtest M (SD)	*p*	*d*
Alcohol	**Do**	**Sincere**	**Lies**		
		.469 (0.5)	**.079 (0.4)**	**.002**	**8.61**
		Sarcasm Pt 2	Sarcasm Pt 3		
		.531 (0.5)	.298 (0.6)	.116	4.22
	Say	Sincere	Lies		
		.436 (0.5)	.419 (0.5)	.901	0.34
		Sarcasm Pt 2	Sarcasm Pt 3		
		.452 (0.5)	.255 (0.5)	.196	3.94
	Think	Sincere	Lies		
		.455 (0.5)	.360 (0.5)	.449	1.90
		Sarcasm Pt 2	Sarcasm Pt 3		
		.411 (0.5)	.587 (1.2)	.501	0.21
	Feel	Sincere	Lies		
		.346 (0.5)	.424 (0.5)	.562	1.56
		Sarcasm Pt 2	Sarcasm Pt 3		
		.534 (0.6)	.378 (0.5)	.341	2.83

Placebo	**Do**	**Sincere**	**Lies**		
		.517 (0.5)	**.043 (0.5)**	**< .001**	**9.48**
		Sarcasm Pt 2	Sarcasm Pt 3		
		.441 (0.6)	.102 (0.5)	.050	6.14
	Say	Sincere	Lies		
		.548 (0.6)	.286 (0.6)	.118	4.37
		Sarcasm Pt 2	Sarcasm Pt 3		
		.562 (0.6)	.397(0.7)	.357	2.53
	Think	Sincere	Lies		
		.670 (0.6)	.392 (0.7)	.039	4.26
		Sarcasm Pt 2	Sarcasm Pt 3		
		.444 (0.5)	.688 (1.1)	.318	0.31
	Feel	Sincere	Lies		
		.454 (0.5)	.321 (0.6)	.384	2.41
		Sarcasm Pt 2	Sarcasm Pt 3		
		.550 (0.6)	.345(0.5)	.182	3.71

Appendix N Statistical Output

Demographic Data

Age

Group Statistics

	Condition	N	Mean	Std. Deviation	Std. Error Mean
Age	1	26	23.31	4.325	.848
	2	21	22.71	3.227	.704

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Age	Equal variances assumed	1.863	.179	.522	45	.604	.593	1.137	-1.697	2.883
	Equal variances not assumed			.538	44.760	.593	.593	1.102	-1.627	2.814

Gender

Condition * Sex Crosstabulation

			Sex		
			0	1	Total
Condition	1	Count	13	13	26
		% within Condition	50.0%	50.0%	100.0%
	2	Count	11	10	21
		% within Condition	52.4%	47.6%	100.0%
Total		Count	24	23	47
		% within Condition	51.1%	48.9%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.026[a]	1	.871		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.026	1	.871		
Fisher's Exact Test				1.000	.552
Linear-by-Linear Association	.026	1	.872		
N of Valid Cases	47				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.28.

b. Computed only for a 2x2 table

Education

Group Statistics

	Condition	N	Mean	Std. Deviation	Std. Error Mean
Education	1	26	11.77	.652	.128
	2	20	11.75	.851	.190

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Education	Equal variances assumed	1.425	.239	.087	44	.931	.019	.221	-.427	.465
	Equal variances not assumed			.084	34.656	.934	.019	.229	-.446	.485

SEQ – Social Emotional Questionnaire

Group Statistics

	Condition	N	Mean	Std. Deviation	Std. Error Mean
EmotRecog	1	26	21.0000	2.57682	.50536
	2	21	20.7619	2.96487	.64699
EmoEmpathy	1	26	16.5769	2.21220	.43385
	2	21	16.4286	2.48136	.54148
Interpersonal	1	26	8.9615	2.16298	.42419
	2	21	9.3810	1.88351	.41102
Public	1	26	10.3846	1.72225	.33776
	2	21	10.8571	1.35225	.29508
AntiSocial	1	26	13.5385	2.83169	.55534
	2	21	13.8571	2.24245	.48934

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
EmotRecog	Equal variances assumed	.180	.673	.294	45	.770	.23810	.80861	-1.39053	1.86672
	Equal variances not assumed			.290	39.952	.773	.23810	.82096	-1.42119	1.89738
EmoEmpathy	Equal variances assumed	.611	.439	.216	45	.830	.14835	.68527	-1.23186	1.52856
	Equal variances not assumed			.214	40.552	.832	.14835	.69385	-1.25337	1.55007
Interpersonal	Equal variances assumed	1.204	.278	-.700	45	.488	-.41941	.59955	-1.62697	.78814
	Equal variances not assumed			-.710	44.713	.481	-.41941	.59066	-1.60927	.77044
Public	Equal variances assumed	1.208	.278	-1.027	45	.310	-.47253	.46022	-1.39947	.45441
	Equal variances not assumed			-1.054	44.976	.298	-.47253	.44851	-1.37588	.43082
AntiSocial	Equal variances assumed	5.734	.021	-.420	45	.677	-.31868	.75885	-1.84707	1.20971
	Equal variances not assumed			-.431	44.990	.669	-.31868	.74017	-1.80948	1.17212

Baseline Measures – AUDIT, K10, ACS-AN (Affect Naming)

Group Statistics

	Condition	N	Mean	Std. Deviation	Std. Error Mean
AUDIT	1	26	7.35	3.867	.758
	2	21	5.81	4.167	.909
K10	1	26	15.69	4.461	.875
	2	21	14.24	3.604	.787
Affect_Naming	1	26	19.00	1.766	.346
	2	21	18.90	2.119	.462

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
AUDIT	Equal variances assumed	.010	.920	1.308	45	.197	1.537	1.174	-.829	3.902
	Equal variances not assumed			1.298	41.457	.202	1.537	1.184	-.854	3.927
K10	Equal variances assumed	1.222	.275	1.208	45	.233	1.454	1.204	-.970	3.878
	Equal variances not assumed			1.236	44.999	.223	1.454	1.176	-.915	3.824
Affect_Naming	Equal variances assumed	.227	.636	.168	45	.867	.095	.567	-1.046	1.236
	Equal variances not assumed			.165	38.936	.870	.095	.578	-1.073	1.264

Timeline Follow Back

Group Statistics

	Condition	N	Mean	Std. Deviation	Std. Error Mean
Timeline_Followback	1	26	22.50	16.281	3.193
	2	21	15.86	16.668	3.637

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Timeline_Followback	Equal variances assumed	.315	.577	1.376	45	.176	6.643	4.828	-3.080	16.366
	Equal variances not assumed			1.373	42.507	.177	6.643	4.840	-3.121	16.407

Breath Analysis Readings Before TASIT-S Parts 2 and 3

Alcohol Condition

One-Sample Statistics[a]

	N	Mean	Std. Deviation	Std. Error Mean
BrAC_ERT	26	.07192	.018525	.003633
BrAC_SDT	26	.07512	.018036	.003537

a. Condition = 1

One-Sample Test[a]

Test Value = 0

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
BrAC_ERT	19.796	25	.000	.071923	.06444	.07941
BrAC_SDT	21.236	25	.000	.075115	.06783	.08240

a. Condition = 1

Placebo Condition

One-Sample Statistics[a]

	N	Mean	Std. Deviation	Std. Error Mean
BrAC_ERT	21	.00000	.000000[b]	.000000
BrAC_SDT	21	.00000	.000000[b]	.000000

a. Condition = 2

b. t cannot be computed because the standard deviation is 0.

Beverage Rating Scale (BRS)

Group Statistics

	Condition	N	Mean	Std. Deviation	Std. Error Mean
Drinks	1	26	4.462	1.7316	.3396
	2	21	1.667	1.2974	.2831

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Drinks	Equal variances assumed	.256	.615	6.131	45	.000	2.7949	.4558	1.8768	3.7130
	Equal variances not assumed			6.321	44.785	.000	2.7949	.4421	1.9042	3.6855

Manipulation Checks - Biphasic Alcohol Effects Scale (BAES)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	Condition * Subscale	4		3		
	Condition * Time	8		6		
	Condition * Time * Subscale	16		6		
Repeated Effects	Time * Subscale	8	Compound Symmetry	2	Participant_ID	47
Total		37		18		

a. Dependent Variable: score.

Information Criteria[a]

-2 Log Likelihood	2743.112
Akaike's Information Criterion (AIC)	2779.112
Hurvich and Tsai's Criterion (AICC)	2781.094
Bozdogan's Criterion (CAIC)	2867.261
Schwarz's Bayesian Criterion (BIC)	2849.261

The information criteria are displayed in smaller-is-better form.

a. Dependent Variable: score.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	46.703	165.369	.000
Condition * Subscale	2	316.698	82.473	.000
Condition * Time	6	317.536	3.867	.001
Condition * Time * Subscale	6	316.698	3.546	.002

a. Dependent Variable: score.

1. Condition * Time * Subscale

Estimates[a]

Condition	Time	Subscale	Mean	Std. Error	df	95% Confidence Interval	
						Lower Bound	Upper Bound
1	1	1	7.346	2.549	130.915	2.304	12.389
		2	24.577	2.549	130.915	19.535	29.619
	2	1	19.500	2.549	130.915	14.458	24.542
		2	27.923	2.549	130.915	22.881	32.965
	3	1	19.346	2.549	130.915	14.304	24.389
		2	24.231	2.549	130.915	19.188	29.273
	4	1	17.153	2.713	158.438	11.794	22.512
		2	23.153	2.713	158.438	17.794	28.512
2	1	1	6.143	2.836	130.915	.532	11.754
		2	27.286	2.836	130.915	21.675	32.896
	2	1	11.810	2.836	130.915	6.199	17.420
		2	25.333	2.836	130.915	19.723	30.944
	3	1	10.810	2.836	130.915	5.199	16.420
		2	22.143	2.836	130.915	16.532	27.754
	4	1	8.064	2.876	136.747	2.378	13.751
		2	22.664	2.876	136.747	16.978	28.351

a. Dependent Variable: score.

Pairwise Comparisons[a]

Time	Subscale	(I) Condition	(J) Condition	Mean Difference (I-J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c]	
								Lower Bound	Upper Bound
1	1	1	2	1.203	3.813	130.915	.753	-6.340	8.747
		2	1	-1.203	3.813	130.915	.753	-8.747	6.340
	2	1	2	-2.709	3.813	130.915	.479	-10.252	4.835
		2	1	2.709	3.813	130.915	.479	-4.835	10.252
2	1	1	2	7.690*	3.813	130.915	.046	.147	15.234
		2	1	-7.690*	3.813	130.915	.046	-15.234	-.147
	2	1	2	2.590	3.813	130.915	.498	-4.954	10.133
		2	1	-2.590	3.813	130.915	.498	-10.133	4.954
3	1	1	2	8.537*	3.813	130.915	.027	.993	16.080
		2	1	-8.537*	3.813	130.915	.027	-16.080	-.993
	2	1	2	2.088	3.813	130.915	.585	-5.456	9.631
		2	1	-2.088	3.813	130.915	.585	-9.631	5.456
4	1	1	2	9.089*	3.954	146.503	.023	1.275	16.902
		2	1	-9.089*	3.954	146.503	.023	-16.902	-1.275
	2	1	2	.489	3.954	146.503	.902	-7.325	8.302
		2	1	-.489	3.954	146.503	.902	-8.302	7.325

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Dependent Variable: score.

c. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests[a]

Time	Subscale	Numerator df	Denominator df	F	Sig.
1	1	1	130.915	.100	.753
	2	1	130.915	.505	.479
2	1	1	130.915	4.067	.046
	2	1	130.915	.461	.498
3	1	1	130.915	5.012	.027
	2	1	130.915	.300	.585
4	1	1	146.503	5.285	.023
	2	1	146.503	.015	.902

Each F tests the simple effects of Condition within each level combination of the other effects shown. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: score.

Baseline - Emotional Response Task (ERT)

Estimates[a]

Condition	Emotion	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1.0	1	3.474	.065	437.271	3.347	3.601
	2	1.912	.065	437.271	1.785	2.039
	3	.793	.065	437.271	.666	.920
	4	3.042	.065	437.271	2.915	3.169
	5	2.505	.065	437.271	2.378	2.632
	6	1.211	.065	437.271	1.083	1.338
2.0	1	3.615	.067	437.271	3.483	3.747
	2	2.128	.067	437.271	1.996	2.260
	3	1.158	.067	437.271	1.027	1.290
	4	3.166	.067	437.271	3.034	3.298
	5	2.604	.067	437.271	2.472	2.736
	6	1.589	.067	437.271	1.457	1.721

a. Dependent Variable: Score.

Pairwise Comparisons[a]

Emotion	(I) Condition	(J) Condition	Mean Difference (I-J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c]	
							Lower Bound	Upper Bound
1	1.0	2.0	-.141	.093	437.271	.130	-.325	.042
	2.0	1.0	.141	.093	437.271	.130	-.042	.325
2	1.0	2.0	-.216*	.093	437.271	.021	-.399	-.033
	2.0	1.0	.216*	.093	437.271	.021	.033	.399
3	1.0	2.0	-.366*	.093	437.271	.000	-.549	-.182
	2.0	1.0	.366*	.093	437.271	.000	.182	.549
4	1.0	2.0	-.124	.093	437.271	.184	-.307	.059
	2.0	1.0	.124	.093	437.271	.184	-.059	.307
5	1.0	2.0	-.099	.093	437.271	.291	-.282	.085
	2.0	1.0	.099	.093	437.271	.291	-.085	.282
6	1.0	2.0	-.378*	.093	437.271	.000	-.561	-.195
	2.0	1.0	.378*	.093	437.271	.000	.195	.561

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Dependent Variable: Score.

c. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests[a]

Emotion	Numerator df	Denominator df	F	Sig.
1	1	437.271	2.303	.130
2	1	437.271	5.374	.021
3	1	437.271	15.384	.000
4	1	437.271	1.769	.184
5	1	437.271	1.117	.291
6	1	437.271	16.467	.000

Each F tests the simple effects of Condition within each level combination of the other effects shown. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.[a]

a. Dependent Variable: Score.

Manipulation - The Awareness of Social Inference Test – Shortened (TASIT-S)

Mixed Model Analysis

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	Condition * Itemtype	8		7		
	Condition * Subtest	8		6		
	Condition * Itemtype * Subtest	32		18		
Repeated Effects	Itemtype * Subtest	16	Compound Symmetry	2	Participant_ID	47
Total		65		34		

a. Dependent Variable: Score.

Information Criteria[a]

-2 Log Likelihood	6556.809
Akaike's Information Criterion (AIC)	6624.809
Hurvich and Tsai's Criterion (AICC)	6628.128
Bozdogan's Criterion (CAIC)	6815.982
Schwarz's Bayesian Criterion (BIC)	6781.982

The information criteria are displayed in smaller-is-better form.

a. Dependent Variable: Score.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	47.000	4180.555	.000
Condition * Itemtype	6	705.000	3.032	.006
Condition * Subtest	6	705.000	15.054	.000
Condition * Itemtype * Subtest	18	705.000	5.455	.000

a. Dependent Variable: Score.

Pairwise Comparisons[a]

(I) Itemtype	(J) Itemtype	Mean Difference (I-J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c]	
						Lower Bound	Upper Bound
1	2	1.771	1.891	705.000	.349	-1.942	5.483
	3	2.886	1.891	705.000	.127	-.827	6.598
	4	6.701*	1.891	705.000	.000	2.988	10.414
2	1	-1.771	1.891	705.000	.349	-5.483	1.942
	3	1.115	1.891	705.000	.556	-2.598	4.827
	4	4.930*	1.891	705.000	.009	1.218	8.643
3	1	-2.886	1.891	705.000	.127	-6.598	.827
	2	-1.115	1.891	705.000	.556	-4.827	2.598
	4	3.815*	1.891	705.000	.044	.103	7.528
4	1	-6.701*	1.891	705.000	.000	-10.414	-2.988
	2	-4.930*	1.891	705.000	.009	-8.643	-1.218
	3	-3.815*	1.891	705.000	.044	-7.528	-.103

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Dependent Variable: Score.

c. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

5. Condition * Itemtype * Subtest

Estimates[a]

Condition	Itemtype	Subtest	Mean	Std. Error	df	95% Confidence Interval	
						Lower Bound	Upper Bound
1	1	1	70.192	3.827	605.150	62.677	77.708
		2	84.615	3.827	605.150	77.100	92.131
		3	87.500	3.827	605.150	79.985	95.015
		4	79.231	3.827	605.150	71.716	86.746
	2	1	79.808	3.827	605.150	72.292	87.323
		2	83.077	3.827	605.150	75.562	90.592
		3	71.154	3.827	605.150	63.639	78.669
		4	80.000	3.827	605.150	72.485	87.515
	3	1	62.500	3.827	605.150	54.985	70.015
		2	86.154	3.827	605.150	78.639	93.669
		3	71.154	3.827	605.150	63.639	78.669
		4	97.692	3.827	605.150	90.177	105.208
	4	1	65.385	3.827	605.150	57.869	72.900
		2	90.769	3.827	605.150	83.254	98.284
		3	53.846	3.827	605.150	46.331	61.361
		4	77.692	3.827	605.150	70.177	85.208
2	1	1	75.000	4.258	605.150	66.638	83.362
		2	86.667	4.258	605.150	78.304	95.029
		3	86.905	4.258	605.150	78.543	95.267
		4	83.810	4.258	605.150	75.447	92.172
	2	1	82.143	4.258	605.150	73.781	90.505
		2	81.905	4.258	605.150	73.543	90.267
		3	75.000	4.258	605.150	66.638	83.362
		4	86.667	4.258	605.150	78.304	95.029
	3	1	65.476	4.258	605.150	57.114	73.838
		2	83.810	4.258	605.150	75.447	92.172
		3	67.857	4.258	605.150	59.495	76.219
		4	96.190	4.258	605.150	87.828	104.553
	4	1	79.762	4.258	605.150	71.400	88.124
		2	81.905	4.258	605.150	73.543	90.267
		3	73.810	4.258	605.150	65.447	82.172
		4	77.143	4.258	605.150	68.781	85.505

a. Dependent Variable: Score.

Pairwise Comparisons[a]

Itemtype	Subtest	(I) Condition	(J) Condition	Mean Difference (I-J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c]	
								Lower Bound	Upper Bound
1	1	1	2	-4.808	5.725	605.150	.401	-16.051	6.435
		2	1	4.808	5.725	605.150	.401	-6.435	16.051
	2	1	2	-2.051	5.725	605.150	.720	-13.294	9.192
		2	1	2.051	5.725	605.150	.720	-9.192	13.294
	3	1	2	.595	5.725	605.150	.917	-10.648	11.838
		2	1	-.595	5.725	605.150	.917	-11.838	10.648
	4	1	2	-4.579	5.725	605.150	.424	-15.822	6.664
		2	1	4.579	5.725	605.150	.424	-6.664	15.822
2	1	1	2	-2.335	5.725	605.150	.683	-13.578	8.908
		2	1	2.335	5.725	605.150	.683	-8.908	13.578
	2	1	2	1.172	5.725	605.150	.838	-10.071	12.415
		2	1	-1.172	5.725	605.150	.838	-12.415	10.071
	3	1	2	-3.846	5.725	605.150	.502	-15.089	7.397
		2	1	3.846	5.725	605.150	.502	-7.397	15.089
	4	1	2	-6.667	5.725	605.150	.245	-17.910	4.576
		2	1	6.667	5.725	605.150	.245	-4.576	17.910
3	1	1	2	-2.976	5.725	605.150	.603	-14.219	8.267
		2	1	2.976	5.725	605.150	.603	-8.267	14.219
	2	1	2	2.344	5.725	605.150	.682	-8.899	13.587
		2	1	-2.344	5.725	605.150	.682	-13.587	8.899
	3	1	2	3.297	5.725	605.150	.565	-7.946	14.540
		2	1	-3.297	5.725	605.150	.565	-14.540	7.946
	4	1	2	1.502	5.725	605.150	.793	-9.741	12.745
		2	1	-1.502	5.725	605.150	.793	-12.745	9.741
4	1	1	2	-14.377*	5.725	605.150	.012	-25.620	-3.134
		2	1	14.377*	5.725	605.150	.012	3.134	25.620
	2	1	2	8.864	5.725	605.150	.122	-2.379	20.107
		2	1	-8.864	5.725	605.150	.122	-20.107	2.379
	3	1	2	-19.963*	5.725	605.150	.001	-31.206	-8.720
		2	1	19.963*	5.725	605.150	.001	8.720	31.206
	4	1	2	.549	5.725	605.150	.924	-10.694	11.792
		2	1	-.549	5.725	605.150	.924	-11.792	10.694

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Dependent Variable: Score.

c. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).